R&S® FSV-K76/-K77
3GPP TD-SCDMA BTS and UE Measurement Application
Operating Manual

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Test & Measurement

Operating Manual

ROHDE&SCHWARZ

This manual describes the following R&S®FSV options:

- R&S FSV-K76 (1310.8603.02)
- R&S FSV-K77 (1310.8655.02)

This manual is applicable for the following analyzer models with firmware version 2.0 and higher:

- R&S®FSV 3 (1307.9002K03)
- R&S®FSV 7 (1307.9002K07)
- R&S®FSV 13 (1307.9002K13)
- R&S®FSV 30 (1307.9002K30)
- R&S®FSV 40 (1307.9002K39)
- R&S®FSV 40 (1307.9002K40)

The firmware of the instrument makes use of several valuable open source software packages. For information, see the "Open Source Acknowledgement" on the user documentation CD-ROM (included in delivery).
Rohde & Schwarz would like to thank the open source community for their valuable contribution to embedded computing.

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The following abbreviations are used throughout this manual: R&S®FSV is abbreviated as R&S FSV.

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1 Preface

1.1 Documentation Overview

The user documentation for the R&S FSV is divided as follows:

- Quick Start Guide
- Operating Manuals for base unit and options
- Service Manual
- Online Help
- Release Notes

Quick Start Guide

This manual is delivered with the instrument in printed form and in PDF format on the CD. It provides the information needed to set up and start working with the instrument. Basic operations and basic measurements are described. Also a brief introduction to remote control is given. The manual includes general information (e.g. Safety Instructions) and the following chapters:

Chapter 1	Introduction, General information
Chapter 2	Front and Rear Panel
Chapter 3	Preparing for Use
Chapter 4	Firmware Update and Installation of Firmware Options
Chapter 5	Basic Operations
Chapter 6	Basic Measurement Examples
Chapter 7	Brief Introduction to Remote Control
Appendix	Printer Interface
Appendix	LAN Interface

Operating Manuals

The Operating Manuals are a supplement to the Quick Start Guide. Operating Manuals are provided for the base unit and each additional (software) option.

The Operating Manual for the base unit provides basic information on operating the R&S FSV in general, and the "Spectrum" mode in particular. Furthermore, the software options that enhance the basic functionality for various measurement modes are described here. The set of measurement examples in the Quick Start Guide is expanded by more advanced measurement examples. In addition to the brief introduction to remote control in the Quick Start Guide, a description of the basic analyzer commands and programming examples is given. Information on maintenance, instrument interfaces and error messages is also provided.

In the individual option manuals, the specific instrument functions of the option are described in detail. For additional information on default settings and parameters, refer to the data sheets. Basic information on operating the R&S FSV is not included in the option manuals.

The following Operating Manuals are available for the R&S FSV:

- R&S FSV base unit; in addition:
  - R&S FSV-K9 Power Sensor Support
  - R&S FSV-K14 Spectrogram Measurement
- R&S FSV-K7 Analog Demodulation and R&S FSV-K7S FM Stereo Measurements
- R&S FSV-K10 GSM/EDGE Measurement
- R&S FSV-K30 Noise Figure Measurement
- R&S FSV-K40 Phase Noise Measurement
- R&S FSV-K70 Vector Signal Analysis Operating Manual
  R&S FSV-K70 Vector Signal Analysis Getting Started (First measurements)
- R&S FSV-K72 3GPP FDD BTS Analysis
- R&S FSV-K73 3GPP FDD UE Analysis
- R&S FSV-K76/77 3GPP TD-SCDMA BTS/UE Measurement
- R&S FSV-K82/83 CDMA2000 BTS/MS Analysis
- R&S FSV-K84/85 1xEV-DO BTS/MS Analysis
- R&S FSV-K91 WLAN IEEE 802.11a/b/g/j/n
- R&S FSV-K93 WiMAX IEEE 802.16 OFDM/OFDMA Analysis
- R&S FSV-K100/K104 EUTRA / LTE Downlink Measurement Application
- R&S FSV-K101/K105 EUTRA / LTE Uplink Measurement Application

These manuals are available in PDF format on the CD delivered with the instrument. The printed manual can be ordered from Rohde & Schwarz GmbH & Co. KG.

Service Manual

This manual is available in PDF format on the CD delivered with the instrument. It describes how to check compliance with rated specifications, instrument function, repair, troubleshooting and fault elimination. It contains all information required for repairing the R&S FSV by replacing modules. The manual includes the following chapters:

Chapter 1	Performance Test
Chapter 2	Adjustment
Chapter 3	Repair
Chapter 4	Software Update / Installing Options
Chapter 5	Documents

Online Help

The online help contains context-specific help on operating the R&S FSV and all available options. It describes both manual and remote operation. The online help is installed on

the R&S FSV by default, and is also available as an executable .chm file on the CD delivered with the instrument.

Release Notes

The release notes describe the installation of the firmware, new and modified functions, eliminated problems, and last minute changes to the documentation. The corresponding firmware version is indicated on the title page of the release notes. The current release notes are provided in the Internet.

1.2 Conventions Used in the Documentation

1.2.1 Typographical Conventions

The following text markers are used throughout this documentation:

Convention	Description
"Graphical user interface elements"	All names of graphical user interface elements on the screen, such as dialog boxes, menus, options, buttons, and softkeys are enclosed by quotation marks.
KEYS	Key names are written in capital letters.
`File names, commands, program code`	File names, commands, coding samples and screen output are distinguished by their font.
Input	Input to be entered by the user is displayed in italics.
Links	Links that you can click are displayed in blue font.
"References"	References to other parts of the documentation are enclosed by quotation marks.

1.2.2 Conventions for Procedure Descriptions

When describing how to operate the instrument, several alternative methods may be available to perform the same task. In this case, the procedure using the touchscreen is described. Any elements that can be activated by touching can also be clicked using an additionally connected mouse. The alternative procedure using the keys on the instrument or the on-screen keyboard is only described if it deviates from the standard operating procedures.

The term "select" may refer to any of the described methods, i.e. using a finger on the touchscreen, a mouse pointer in the display, or a key on the instrument or on a keyboard.

1.3 How to Use the Help System

Calling context-sensitive and general help

► To display the general help dialog box, press the HELP key on the front panel.

The help dialog box "View" tab is displayed. A topic containing information about the current menu or the currently opened dialog box and its function is displayed.

For standard Windows dialog boxes (e.g. File Properties, Print dialog etc.), no context-sensitive help is available.

► If the help is already displayed, press the softkey for which you want to display help.

A topic containing information about the softkey and its function is displayed.

If a softkey opens a submenu and you press the softkey a second time, the submenu of the softkey is displayed.

Contents of the help dialog box

The help dialog box contains four tabs:

- "Contents" - contains a table of help contents
- "View" - contains a specific help topic
- "Index" - contains index entries to search for help topics
- "Zoom" - contains zoom functions for the help display

To change between these tabs, press the tab on the touchscreen.

Navigating in the table of contents

- To move through the displayed contents entries, use the UP ARROW and DOWN ARROW keys. Entries that contain further entries are marked with a plus sign.
- To display a help topic, press the ENTER key. The "View" tab with the corresponding help topic is displayed.
- To change to the next tab, press the tab on the touchscreen.

Navigating in the help topics

- To scroll through a page, use the rotary knob or the UP ARROW and DOWN ARROW keys.
- To jump to the linked topic, press the link text on the touchscreen.

Searching for a topic

1. Change to the "Index" tab.

2. Enter the first characters of the topic you are interested in. The entries starting with these characters are displayed.
3. Change the focus by pressing the ENTER key.
4. Select the suitable keyword by using the UP ARROW or DOWN ARROW keys or the rotary knob.
5. Press the ENTER key to display the help topic.

   The "View" tab with the corresponding help topic is displayed.

Changing the zoom

1. Change to the "Zoom" tab.
2. Set the zoom using the rotary knob. Four settings are available: 1-4. The smallest size is selected by number 1, the largest size is selected by number 4.

Closing the help window

► Press the ESC key or a function key on the front panel.

2 Introduction

Equipped with the firmware application R&S FSV-K76, the R&S FSV performs code domain measurements on forward link signals according to the 3GPP standard (Third Generation Partnership Project).

Equipped with the firmware application R&S FSV-K77, the R&S FSV performs code domain measurements on downlink signals according to the 3GPP standard (Third Generation Partnership Project).

The basic standards are 3GPP TS 25.142 "Base Station Conformance Testing (TDD)", version V8.1.0, 3GPP TS 25.221 "Physical channels and mapping of transport channels onto physical channels (TDD)". When TD–SCDMA specifications are mentioned in the document, this standard is meant.

In addition to the code domain measurements specified in the TD–SCDMA standard, the firmware application features measurements in the spectral range such as channel power, adjacent channel power, occupied bandwidth and spectrum emission mask with predefined settings.

Overview of the Firmware Options R&S FSV-K76 and R&S FSV-K77

This section contains all information required for operation of an R&S FSV equipped with Application Firmware R&S FSV-K76 and R&S FSV-K77. It covers operation via menus and the remote control commands for the 3GPP TD-SCDMA BTS and UE Measurement Application.

To open the TD-SCDMA BTS and UE measurement application

- Press the MODE key and select "TDS BTS" (R&S FSV-K76) or TDS UE (R&S FSV-K77) from the softkey menu.

The TD-SCDMA main menu opens. This is identical to the "Measurement" menu (MEAS key).

Note that you can return to the main menu anytime by pressing either the MEAS key or the HOME key.

This part of the documentation contains of the following topics:

3 Instrument Functions

The following chapters describe all functions available with the firmware application in detail, beginning with some background information on the various measurements.

Channel Characteristics

Depending on the symbol rate of a code channel, it has a different spreading factor and a different number of symbols per slot. The following table shows the relationships:

Spreading Factor	Symbols / Slot	QPSK		8PSK		16QAM		64QAM	
		Bits per Slot	ksps	Bits per slot	ksps	Bits per slot	ksps	Bits per slot	ksps
1	704	1408	281.6	2112	422.4	2816	563.2	4224	844.8
2	352	704	140.8	1056	211.2	1408	281.6	2112	422.4
4	176	352	70.4	528	105.6	704	140.8	1056	211.2
8	88	176	35.2	264	52.8	352	70.4	528	105.6
16	44	88	17.6	132	26.4	176	35.2	264	52.8

The data rates in the table result from the bits per slot referred to a subframe length of 5 ms.

You can select the code channel and the slot to be analyzed with the "Select Channel" and the "Select Slot" softkeys. For example, select code channel 1.16 (code number 1 for spreading factor 16) and slot 2. Activate the Code Domain Power result display in one screen and EVM vs Symbol in a second screen. Screen A shows the Code Domain Power of slot number 2 and selects code channel 1.16, which turns red. Screen B shows the results of the EVM vs Symbol measurement of code channel 1.16 in slot 2 with 44 corresponding values (derived from the table above).

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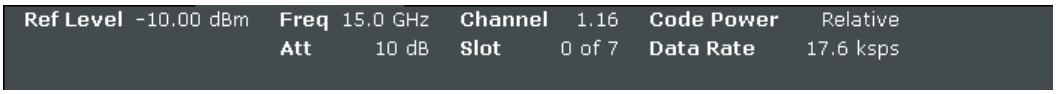
3.1 Code Domain Analysis

The Code Domain Analyzer provides the following result displays for measurements in the code domain:

Result Display	Description
Code Domain Power	Result display for the Code Domain Power
Composite EVM	Error Vector Magnitude on slot level.
Peak Code Domain Error	Maximum error between test signal and reference signal of the selected slot.
Code Domain Error Power	Error between test signal and reference signal.
Power vs Symbol	Channel power on symbol level.
Channel Power vs Slot	Average power of a specific channel over all slots.
Result Summary	Summary of results in tabular form.
Channel Table	Summary of channel configuration in tabular form.
Channel Constellation	Channel constellation diagram.
EVM vs Symbol	Error Vector Magnitude on symbol level.
Channel Bitstream	Summary of bits in a specific channel.
Composite Constellation	Constellation diagram on chip level.

You can display up to four result displays at the same time. Any result can be displayed in either screen. For further details on the display configuration refer to the Display Configurationsoftkey. Just above the measurement screen(s), the most common settings and parameters are summarized:



The default settings of the Code Domain Analyzer are summarized in the Settings Overview dialog box. There you can also reset the instrument to its default values by pressing the "Set to Default" button.

3.1.1 Menu and Softkey Description

The following chapters describe the menus and softkeys specific to the R&S FSV-76 and 77 options for CDA measurements.

The "Bandwidth", "Span" and "Marker" menus are not available for CDA measurements.

All menus not described here are the same as for the base unit, see the description there.

Importing and Exporting I/Q Data

As of firmware version 1.60, I/Q data can be imported from a file for processing in R&S FSV-K76/-K77, and captured I/Q data can be stored to a file ("IQ Import"/"IQ Export" softkeys in the "Save/Rcl" menu). For details see the base unit description.

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3.1.1.1 Softkeys of the Code Domain Analyzer

The following chapter describes all softkeys available in the "Code Domain Analyzer" menu of the TD-SCDMA BTS and UE measurement applications.

You can also access the main menu using the MEAS CONFIG hardkey.

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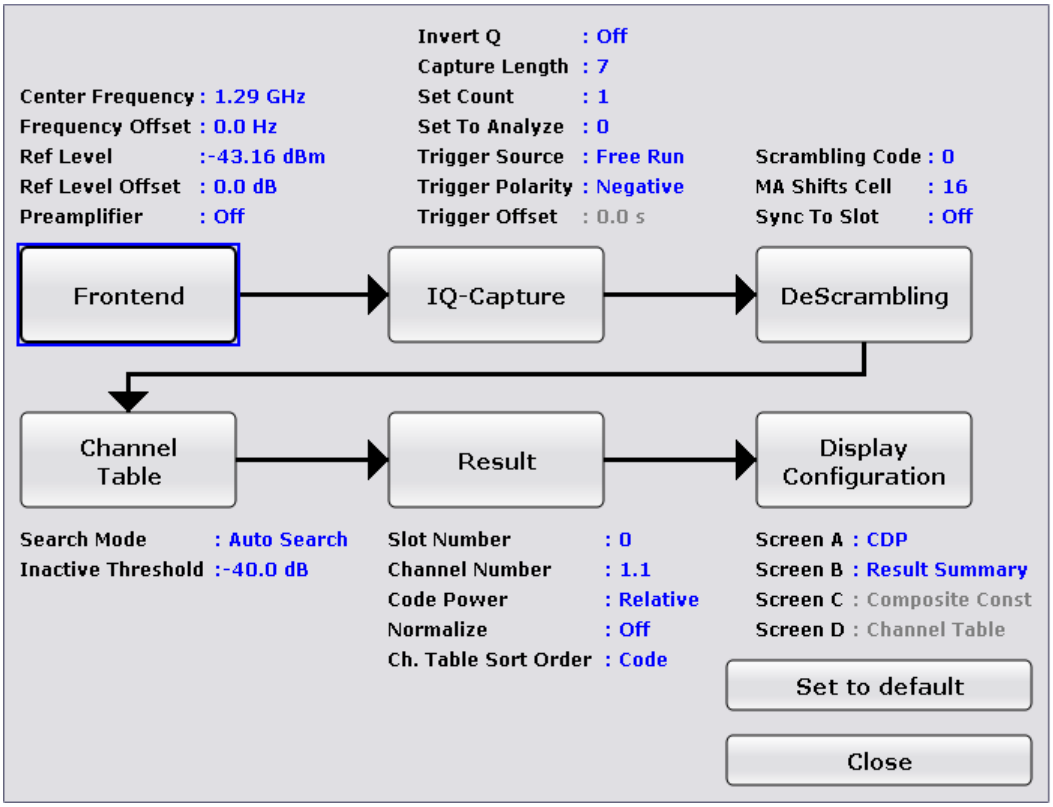
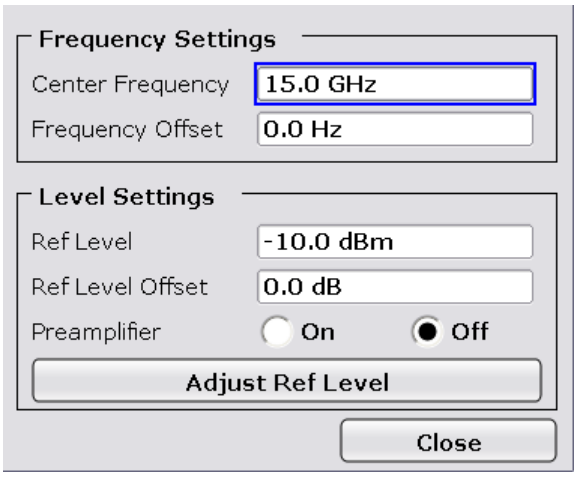
Select Ch Slot....38
Adjust Ref Lvl....38

Settings Overview
This softkey opens the "Settings Overview" dialog box that visualizes the data flow of the Code Domain Analyzer and summarizes all of the current settings. In addition, you can change the current settings via this dialog box.



To change the settings press one of the buttons on the touchscreen.

Frontend Settings
This softkey opens the "Frontend Settings" dialog box to modify the following parameters:



Center ← Frontend Settings
Opens an edit dialog box to enter the center frequency. The allowed range of values for the center frequency depends on the frequency span.

span > 0: $span_{min}/2 \leq f_{center} \leq f_{max} - span_{min}/2$

span = 0: $0\ Hz \leq f_{center} \leq f_{max}$

f_{max} and $span_{min}$ are specified in the data sheet.

Remote command:
[SENSe:]FREQuency:CENTer on page 200

Frequency Offset ← Frontend Settings
Opens an edit dialog box to enter a frequency offset that shifts the displayed frequency range by the specified offset.

The softkey indicates the current frequency offset. The allowed values range from -100 GHz to 100 GHz. The default setting is 0 Hz.

Remote command:
[SENSe:]FREQuency:OFFSet on page 202

Ref Level ← Frontend Settings
Opens an edit dialog box to enter the reference level in the current unit (dBm, dBµV, etc).

The reference level is the maximum value the AD converter can handle without distortion of the measured value. Signal levels above this value will not be measured correctly, which is indicated by the "IFOVL" status display.

Remote command:
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel on page 175

Ref Level Offset ← Frontend Settings
Opens an edit dialog box to enter the arithmetic level offset. This offset is added to the measured level irrespective of the selected unit. The scaling of the y-axis is changed accordingly. The setting range is ±200 dB in 0.1 dB steps.

Remote command:
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet on page 175

Preamp On/Off ← Frontend Settings
Switches the preamplifier on and off.

If option R&S FSV-B22 is installed, the preamplifier is only active below 7 GHz.

If option R&S FSV-B24 is installed, the preamplifier is active for all frequencies.

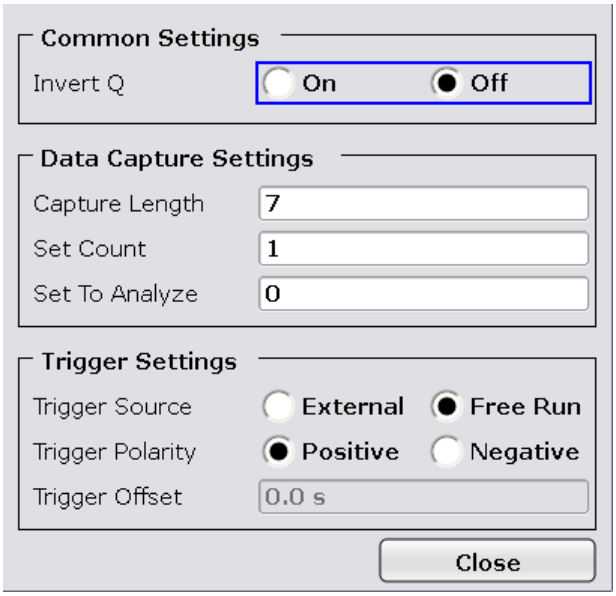
This function is not available for input from the R&S Digital I/Q Interface (option R&S FSV-B17).

Remote command:
INPut:GAIN:STATe on page 230

Adjust Ref Lvl ← Frontend Settings
Defines the optimal reference level for the current measurement automatically.

Remote command:
[SENSe:]ADJust:LEVel on page 186

IQ-Capture Settings
This softkey opens the "IQ-Capture Settings" dialog box.



Invert Q ← IQ-Capture Settings
Inverts the sign of the signal's Q-component. The default setting is OFF.

Remote command:
`[SENSe:]CDPower:QINVert` on page 180

Capture Length ← IQ-Capture Settings
Sets the number of slots you want to analyze. The input value is always in multiples of the slots. The default value is 7. The maximum capture length is 63.

The "Capture Length" field is available if Set Count equals 1.

Remote command:
`[SENSe:]CDPower:IQLength` on page 178

Set Count ← IQ-Capture Settings
Defines the number of consecutive sets to be stored in the instrument's IQ memory. One set consists of 63 slots. The R&S FSV can capture up to 6300 slots in a single sweep, i.e. the possible value range is from 1 to 100 sets.

The default setting is 1. In that case you can still define the number of slots. In case you want to capture more than one set, the capture length is always 63. The R&S FSV automatically sets the capture length to 63 and the Capture Length field is not available for modification.

Remote command:
`[SENSe:]CDPower:SET:COUNt` on page 181

Set to Analyze ← IQ-Capture Settings
Selects a specific set for further analysis. The value range depends on the "IQ-Capture Settings" on page 19 and is between 0 and [Set Count-1].

Remote command:
`[SENSe:]CDPower:SET` on page 180

Trigger Source Free Run ← IQ-Capture Settings
The start of a sweep is not triggered. Once a measurement is completed, another is started immediately.

This softkey is available for code domain measurements.

Remote command:
`TRIG:SOUR IMM`, see `TRIGger<n>[:SEQuence]:SOURce` on page 233

Trigger Source External ← IQ-Capture Settings
Defines triggering via a TTL signal at the "EXT TRIG/GATE IN" input connector on the rear panel.

An edit dialog box is displayed to define the external trigger level.

This softkey is available for code domain measurements.

Remote command:
`TRIG:SOUR EXT`, see `TRIGger<n>[:SEQuence]:SOURce` on page 233

Trigger Polarity ← IQ-Capture Settings
Sets the polarity of the trigger source.

The sweep starts after a positive or negative edge of the trigger signal. The default setting is "Pos". The setting applies to all modes with the exception of the "Free Run" and "Time" mode.

This softkey is available for code domain measurements.

"Pos" Level triggering: the sweep is stopped by the logic "0" signal and restarted by the logical "1" signal after the gate delay time has elapsed.

"Neg" Edge triggering: the sweep is continued on a "0" to "1" transition for the gate length duration after the gate delay time has elapsed.

Remote command:
`TRIGger<n>[:SEQuence]:SLOPe` on page 233
`[SENSe:]SWEep:EGATe:POLarity` on page 214

Trigger Offset ← IQ-Capture Settings
Opens an edit dialog box to enter the time offset between the trigger signal and the start of the sweep.

offset > 0:	Start of the sweep is delayed
offset < 0:	Sweep starts earlier (pre-trigger) Only possible for span = 0 (e.g. I/Q Analyzer mode) and gated trigger switched off Maximum allowed range limited by the sweep time: $pretrigger_{max}$ = sweep time When using the R&S Digital I/Q Interface (R&S FSV-B17) with I/Q Analyzer mode, the maximum range is limited by the number of pretrigger samples. See the R&S Digital I/Q Interface(R&S FSV-B17) description in the base unit.

In the "External" or "IF Power" trigger mode, a common input signal is used for both trigger and gate. Therefore, changes to the gate delay will affect the trigger delay (trigger offset) as well.

Remote command:
`TRIGger<n>[:SEQuence]:HOLDoff[:TIME]` on page 232

Sync Settings
This softkey opens the "Synchronization Settings" dialog box.

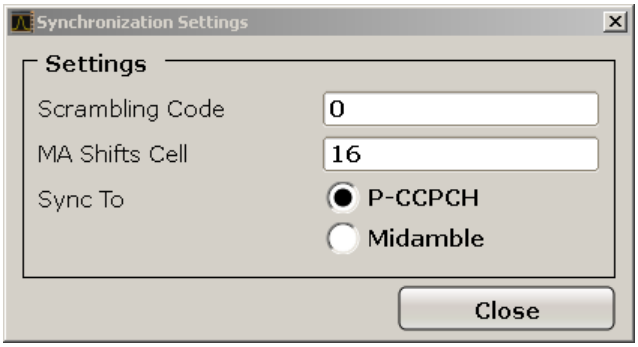


Fig. 3-1: Syncronization Settings for forward link measurements (K76)

Scrambling Code ← Sync Settings
Sets the Scrambling Code of the base station. Possible values are between 0 and 127 and have to be entered as decimals.

Remote command:
`[SENSe:]CDPower:SCODe` on page 180

MA Shift Cells ← Sync Settings
Sets the maximum number of usable midamble shifts of the base station. Possible values are in the range from 2 to 16 in steps of 2 midamble shifts.

If you use a predefined channel table, this value is replaced by that of the channel table.

Remote command:
`[SENSe:]CDPower:MSHift` on page 179

Sync To (forward link, K76) ← Sync Settings
Toggles the phase reference.

"P-CCPCH" By default, the R&S FSV-K76 determines the phase reference for all downlink data slots from the downlink pilot channel (P-CCPCH) in slot 0. For some measurements like beamforming or repeater measurements, it might be necessary to apply different phase offsets to each time slot. In these timeslots, using the P-CCPCH as phase reference leads to rotated constellation diagrams and bad EVM results.

"Midamble" The R&S FSV-K76 determines the phase reference from the midamble of the selected slot. With this method, the data slots can be phase rotated to each other and a degradation of the EVM results can be avoided. For a successful synchronization, the selected slot must contain at least one data channel with sufficient power.

Remote command:
`[SENSe:]CDPower:STSLot` on page 181

Sync To (downlink, K77) ← Sync Settings
Toggles the phase reference. For a successful synchronization, the selected slot must contain at least one data channel with sufficient power.

"Code Channel" The R&S FSV-K77 determines the phase reference from the code channel of the selected slot. This is useful when synchronization fails in bad SNR environments. For code channel synchronization, at least one of the code channels must be QPSK or 8PSK modulated.

"Midamble" By default, the R&S FSV-K77 determines the phase reference from the midamble of the selected slot. With this method, the data slots can be phase rotated to each other and a degradation of the EVM results can be avoided.

Remote command:
`[SENSe:]CDPower:STSLot:MODE` on page 182

Rotate code channel to associated midamble ← Sync Settings
By default, the R&S FSV-K76/77 determines one phase reference for all midambles and code channels of a data slot. If this option is selected, phase rotations between the code channels are allowed. Each code channel gets its own phase reference from the associated midamble according to section AA.2 of the standard document 3GPP TS 25.221. If the associated midamble is missing, the common phase reference is used for this code channel.

Remote command:
`[SENSe:]CDPower:STSLot:ROTate` on page 182

Channel Table Settings
Opens the "Channel Table Settings" dialog box and the corresponding submenu.

Max Modulation ← Channel Table Settings
Defines the highest modulation to be considered in the automatic channel search. In low SNR environments it may be necessary to limit the channel search to lower modulations than 64QAM. The following types are available:

- QPSK
- 8PSK
- 16QAM
- 64QAM

Remote command:
`[SENSe:]CDPower:MMAX` on page 179

Channel Search Mode ← Channel Table Settings
Defines the kind of channel table used for the measurement.

Predefined channel tables are a way to customize measurements. The RECENT channel table contains the last configuration used before switching from Auto Search to Predefined. In addition, new channel tables can be created and saved to be used in measurements.

"Auto Search" The Auto Search mode scans the whole code domain, including all permissible symbol rates and channel numbers, for active channels. The automatic search provides an overview of the channels contained in the signal. If channels are not detected as being active, change the Inactive Channel Threshold or select the Predefined channel search type.

"Predefined" Performs the code domain measurement on the basis of the active predefined channel table. All channels of a channel table are assumed to be active. For further details also refer to the Inactive Channel Threshold field and the "Predefined Channel Tables"

Remote command:
`CONFigure:CDPower[:BTS]:CTABle[:STATe]` on page 165
`CONFigure:CDPower[:BTS]:CTABle:SELect` on page 169

Inactive Channel Threshold ← Channel Table Settings
Defines the minimum power which a single channel must have compared to the total signal in order to be recognized as an active channel. Channels below the specified threshold are regarded as "inactive". The parameter is available in the Auto Search mode of the "Channel Table Settings" dialog box. The default value is -40 dB. With this value all channels with signals such as the TD-SCDMA test models are located by the Code Domain Power analysis. Decrease the Inactive Channel Threshold value, if not all channels contained in the signal are detected.

Remote command:
`[SENSe:]CDPower:ICThreshold` on page 178

Channel Tables ← Channel Table Settings
In this field a list of the available channel tables is shown. To activate a predefined channel table, select the table name by using either the touchscreen or the the cursor keys and pressing the ENTER key. The selected channel table is the basis for future measurements (until you choose another or select Auto Search).

An active channel table must completely describe the supplied signal. Using the softkeys, customized channel tables can be defined or existing channel tables can be modified.

Remote command:
`CONFigure:CDPower[:BTS]:CTABle:CATalog?` on page 166

New / Copy / Edit ← Channel Table Settings
All three softkeys open a dialog box with the same layout and the same corresponding submenu.

The "New" softkey opens the "New Channel Table" dialog box. In this dialog you can build a new channel table. All fields are empty.

The "Copy" softkey copies all elements of the selected channel table and opens the "Copy Channel Table" dialog box. The name of the new channel table is set to 'Copy of <SourceChannelTableName>'.

The "Edit" softkey opens the "Edit Channel Table" dialog box and the corresponding menu. In this dialog box you can edit an existing channel table.

Note that changes are never saved automatically. Remember to save your channel tables before ending the application.

Note: Prerequisite. The code domain analyzer requires an active channel 1.16 (e.g. P–CCPCH1) and a valid midamble in slot 0 for synchronization. The parameters "Scrambling Code" and "MA Shifts Cell" must comply with the base station.

The dialog box contains the following items. You can modify the white fields as you like. The grey fields can not be modified; these are automatically calculated by the R&S FSV:

Item	Description
Name	Enter the name of the selected channel table, which will be saved under <name>.xml. The name is case sensitive and may not contain spaces. It must be a valid MS Windows file name. Note that the old channel table file is not deleted.
Description	Enter further information about the channel table.
MA Shift Cells	Sets the maximum number of usable midamble shifts of the base station.
Channel Type	Select one of the channel types from the dropdown menu.
Walsh Ch.SF	Enter the Channel Number (Ch) and Spreading Factor (SF). For some channel types the possible values are limited or preset (e.g. F-PICH, F-TDPICH and F-PDCH).
Data Rate / kbps	Display of the data rate.
Modulation	Enter the modulation type for the channel.
Midamble Shift	Shift of the associated midamble if a common or default midamble allocation is detected.
State	Indicates whether a channel is active or inactive.
Domain Conflict	A red bullet indicates if there's a conflict of any sorts between two or more channels (e.g. two conflicting channel codes).

Remote command:

```
CONFigure:CDPower[:BTS]:CTABle:NAME
CONFigure:CDPower[:BTS]:CTABle:COPY
```

Add Channel ← New / Copy / Edit ← Channel Table Settings

Inserts a new channel below the one selected. For a description of the parameters of the channel refer to the Channel Table Settings softkey. The default values for a new channel are:

Channel Type	Midamble
Walsh Ch.SF	2.64
Data Rate / kbps	19.2 (automatically calculated)
Modulation	QPSK

Midamble Shift	---
State	Off
Domain Conflict	No (automatically determined)

To change the channel type use the dropdown menu that opens when selecting / highlighting the "Channel Type" field that you want to change. Modulation settings are changed in the same way.

To change the channel number, type another channel number in the form 'ChannelNumber.SpreadingFactor' or just the code number in the respective field. Confirm the change with the ENTER key.

To activate or deactivate a channel, select the "State" field and confirm with the ENTER key.

The R&S FSV automatically checks for conflicts between two active channels.

Remote command:
`CONFigure:CDPower[:BTS]:CTABle:DATA` on page 167

Delete Channel ← New / Copy / Edit ← Channel Table Settings
Deletes the selected channel without further notice.

Meas ← New / Copy / Edit ← Channel Table Settings
Initiates a measurement in "Channel Search Mode" on page 24 mode. The measurement results are applied to the active channel table. The active channel table is overwritten without further notice.

The softkey is only available if you have selected the Auto Search mode in the "Channel Table Settings" dialog box.

Select Slot ← New / Copy / Edit ← Channel Table Settings
Selects the slot for which the channel table is valid.

Sort Midamble ← New / Copy / Edit ← Channel Table Settings
Sets the Result Settings to midamble order.

This softkey is available for the 3GPP TD-SCDMA BTS Measurement Application.

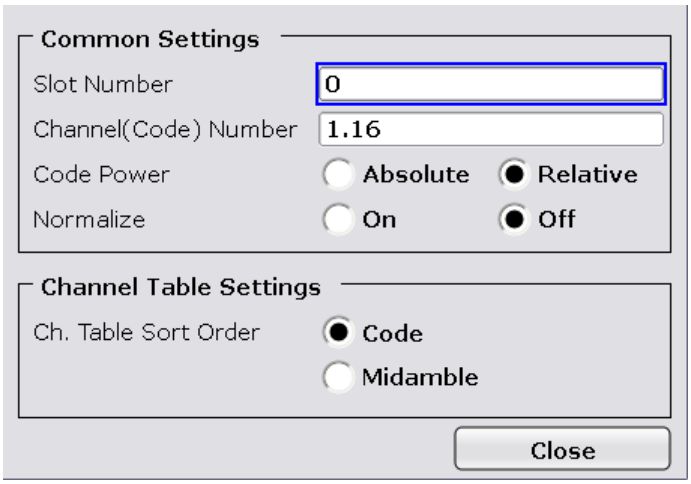
Sort Code ← New / Copy / Edit ← Channel Table Settings
Sets the Result Settings to Code order.

Reload ← New / Copy / Edit ← Channel Table Settings
Reloads the original content of the copied channel table. This softkey is available for the "New Channel Table" dialog box and the "Edit Channel Table" dialog box.

Save ← New / Copy / Edit ← Channel Table Settings
Saves the table under its specified name in the xml-format. If you edit a channel table and want to keep the original channel table, change the name of the edited channel table before saving it.

Delete ← Channel Table Settings
Deletes the selected channel table. The currently active channel table cannot be deleted.

Result Settings
This softkey opens the "Result Settings" dialog box



Slot Number ← Result Settings
Selects the slot number for further evaluation. In result displays that evaluate specific slot, the currently selected slot is highlighted red.

The number of measured slots depends on the IQ-Capture Settings defined in the IQ Capture Settings dialog box. Therefore the range is (0 to Capture Length-1).

Remote command:
CDP:SLOT 6

Channel (Code) Number ← Result Settings
Selects the channel or code number for further evaluation. In result displays that evaluate specific channels, the currently selected channel is highlighted red.

The number of codes depends on the spreading factor. Therefore it is between 1 and 16.

Remote command:
[SENSe:]CDPower:SLOT on page 181

Code Power ← Result Settings
Selects the y-axis scaling for the Code Domain Power result display.

- Absolute scaling shows the code power in dBm.
- Relative scaling shows the code power in dB.

Remote command:
CALCulate<n>:FEED on page 128

Normalize ← Result Settings
Activate this parameter to eliminate the DC offset from the signal. By default, the parameter is deactivated.

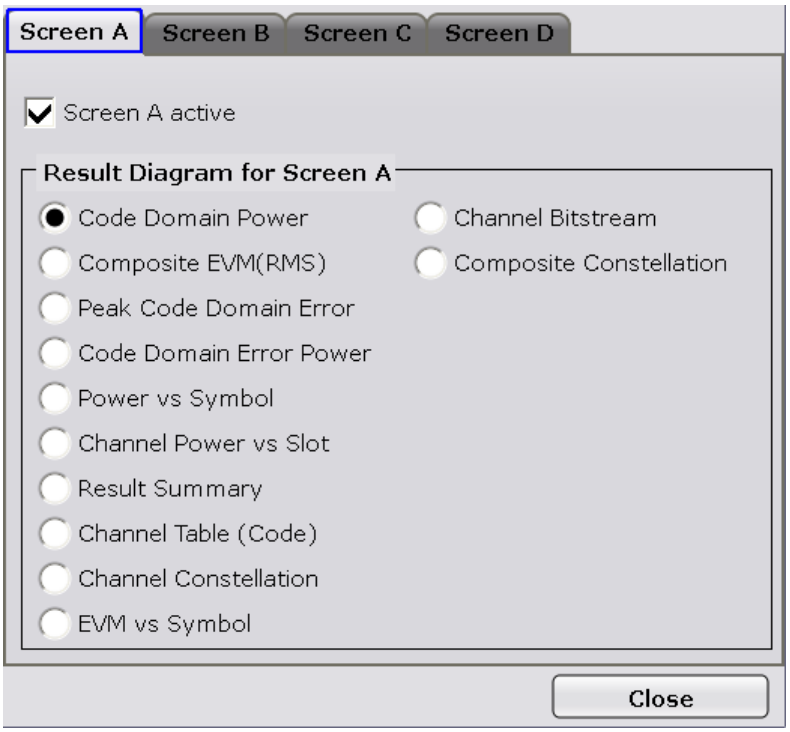
Remote command:
[SENSe:]CDPower:NORMalize on page 180

Channel Table Sort Order ← Result Settings
You can sort channels in the Channel Table result display in two ways:

- Code Order: first, all midambles are listed, then all control channels and last all data channels.
- Midamble Order: allocates all control and data channels to the midambles they belong to and then sorts the midambles in ascending order.

Remote command:
`CONFigure:CDPower[:BTS]:CTABle:ORDer` on page 168

Display Configuration
This softkey opens the "Display Config" dialog box to select the result display. In the Code Domain Analyzer, the results are displayed in up to four screens. Any result can be displayed in either screen.



The dialog box contains the following elements:

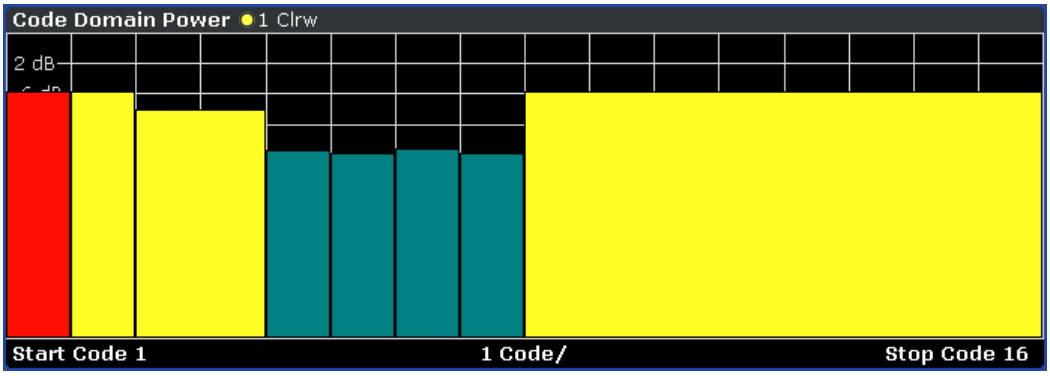
Item	Description
Screen A/B/C/D tab	Choose the screen to be configured.
Screen A/B/C/D active	Activate or deactivate one of the four available measurement screens via this check box. The size of the screens depends on the number of active screens. For example, if four screens are active, each screen takes up a quarter of the display size.

Item	Description
Result diagram for Screen A/B/C/D	Choose the result diagram for each screen. Find a short description of each result display below.
Screen Focus	The currently active screen is indicated by a blue frame. Trace and marker settings can only be changed for the active screen. Changing the focus and screen size is just like in the base unit

Code Domain Power ← Display Configuration
Starts the Code Domain Power (CDP) result display. By default the scaling is relative. This result display determines the power of all codes of a specific channel and plots it in a diagram. The x-axis represents the code number. The number of codes depends on the channel type. Each bar in the diagram represents one code, up to a maximum of 16 (the maximum spreading factor). Codes are always sorted in ascending order and projected to a spreading factor of 16.

The y-axis is a logarithmic level axis that shows the power of each code.

The measurement evaluates the total signal of a specific channel over a single slot. Configure this result display via the Result Settings dialog box.



The power values of the active and inactive channels are displayed in different colors:

- Yellow: active channel
- Cyan: inactive channel
- Red: selected channel; if a channel is made up of more than one code, all codes that belong to the channel turn red.

When working with predefined channel tables, every code is regarded as active.

It is possible to select more detailed result displays for inactive codes, but the results for these are not valid.

Remote command:
`CALCulate<n>:FEED` on page 128
`CALCulate<n>:FEED` on page 128

Composite EVM ← Display Configuration
Starts the Composite EVM (Error Vector Magnitude) result display.

This result display is for measuring the modulation accuracy. It determines the error vector magnitude (EVM) over the total signal. The EVM is the root of the ratio of the mean error power to the power of an ideally generated reference signal. To calculate the mean error power, the root mean square average (of the real and imaginary parts of the signal) is used. The EVM is shown in %.

The diagram consists of a composite EVM for each captured slot.

The measurement evaluates the total signal over the entire period of observation. The selected slot turns red.

Only the channels detected as being active are used to generate the ideal reference signal. If a channel is not detected as being active, e.g. on account of low power, the difference between the test signal and the reference signal and therefore the composite EVM is very large.

Distortions also occur if unassigned codes are wrongly given the status of "active channel". To obtain reliable measurement results, select an adequate channel threshold.

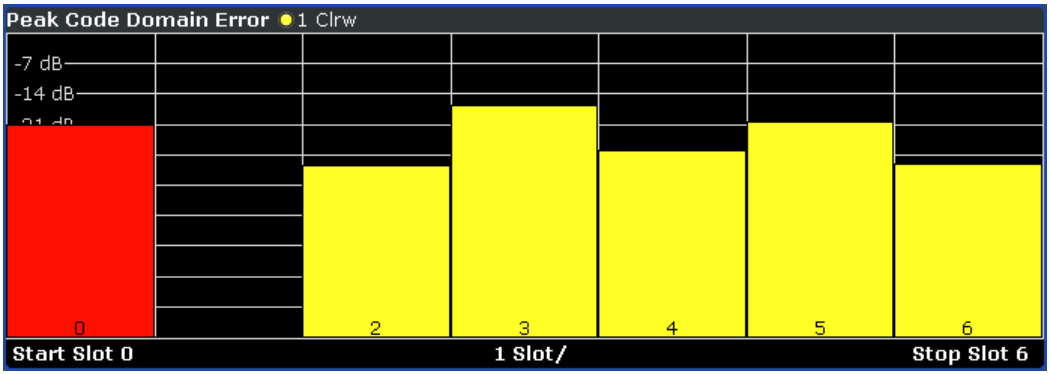
Remote command:

`CALCulate<n>:FEED` on page 128

Peak Code Domain Error ← Display Configuration

Starts the Peak Code Domain Error result display. The Peak Code Domain Error is defined as the maximum value for the Code Domain Error for all codes. That means that in this result display the "Code Domain Error" on page 31 is projected onto the code domain at a specific base spreading factor. In the diagram, each bar of the x-axis represents one captured slot. The selected slot turns red. The y-axis represents the error power.

The measurement evaluates the total signal over the entire period of observation. The currently selected slot turns red.



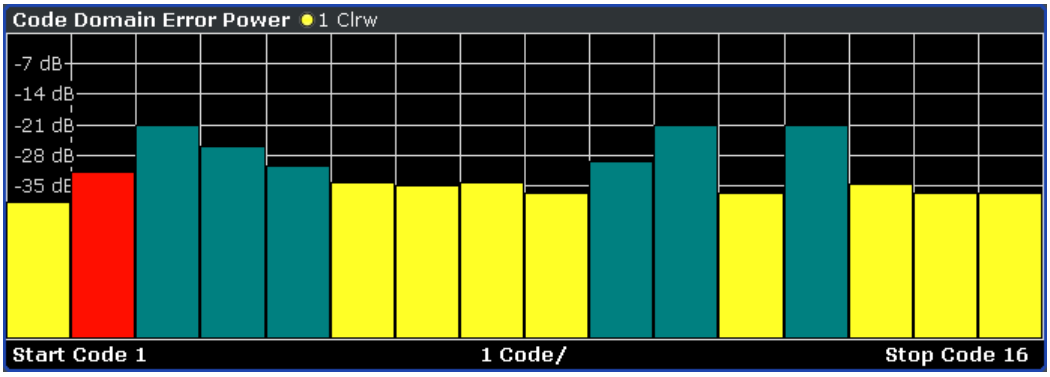
Only the channels detected as being active are used to generate the ideal reference signal. If a channel is not detected as being active, e.g. on account of low power, the difference between the test signal and the reference signal is very large. The result display therefore shows a peak code domain error that is too high for all slots. Distortions also occur if unassigned codes are wrongly given the status of "active channel". To obtain reliable measurement results, select an adequate channel threshold.

Remote command:
`CALCulate<n>:FEED` on page 128

Code Domain Error ← Display Configuration
Starts the Code Domain Error Power result display.

This result display shows the difference in power of the test signal and an ideally generated reference signal. In the diagram, the codes are plotted on the x-axis. The number of codes corresponds to the base spreading factor. The y-axis is a logarithmic level axis that shows the error power for each code. Since it is an error power, active and inactive channels can be rated jointly at a glance.

The measurement evaluates the total signal over a single slot.



The power values of the active and inactive channels are displayed in different colors:

- Yellow: active channel
- Cyan: inactive channel
- Red: selected channel; if a channel is made up of more than one code, all codes that belong to the channel turn red.

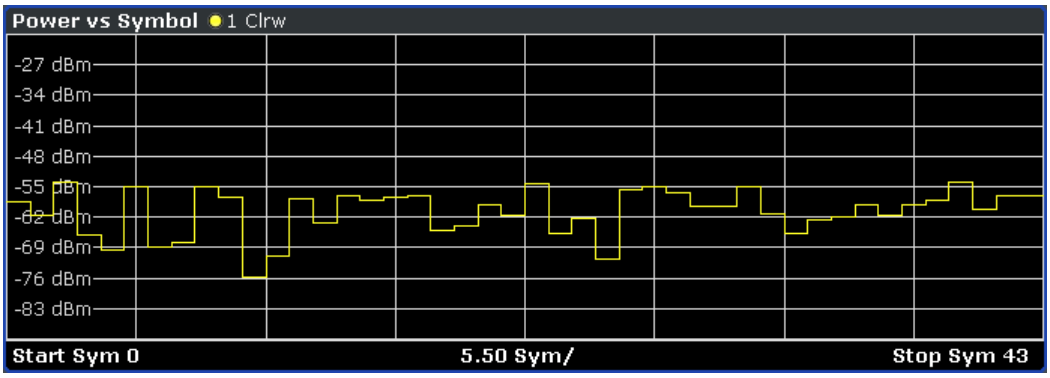
When working with predefined channel tables, every code is regarded as active.

Remote command:
CALCulate<n>:FEED on page 128

Power vs Symbol ← Display Configuration
Starts the Power vs Symbol result display.

This result display shows the power of a specific channel on symbol level. The number of symbols on the x-axis depends on the spreading factor.

The measurement evaluates a single channel over a single slot.

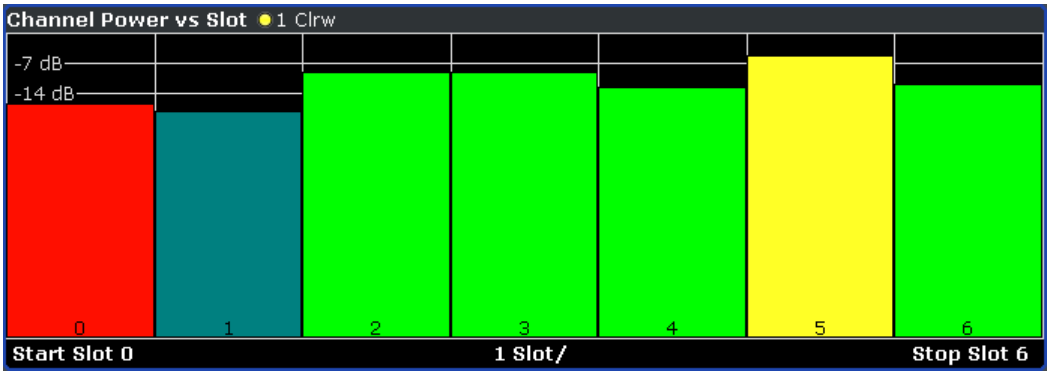


Remote command:
CALCulate<n>:FEED on page 128

Channel Power vs Slot ← Display Configuration
Starts the Channel Power vs Slot result display.

This result display shows the average power of a specific channel over all captured slots. The scaling is either relative or absolute. Therefore, the unit of the y-axis is either dBm or dB. By default, the display is relative to the mean total power of the data parts of the slot. Each bar on the x-axis represents one of the captured slots.

The measurement evaluates a single channel over all slots. The currently selected slot turns red.



The power values of the active and inactive channels are displayed in different colors:

- Yellow: active channel
- Cyan: inactive channel
- Green: channel with alias power

- Red: selected channel; if a channel is made up of more than one code, all codes that belong to the channel turn red.

Alias power results from channels with a different code class.

When working with predefined channel tables, every code is regarded as active.

Remote command:
CALCulate<n>:FEED on page 128

Result Summary ← Display Configuration
The Result Summary shows the data of various measurements in numerical form.

Result Summary (Set : 1) ● 1 Clrw			
Chip Rate Error	-0.13 ppm	Trigger To Frame	--.--
Slot Result (Slot : 0)			
P Data	-28.89 dBm	Carrier Frequency Error	3.39 Hz
P D1/D2	-28.89dBm/-28.88dB	IQ Imbalance/Offset	0.46%/2.23%
P Midamble	-30.15 dBm	Rho	0.96761
Average RCDE	-19.47 dB	Composite EVM	18.30 %
Active Channels	10	Pk CDE (SF 16)	-21.03 dB
Channel Result (Channel 2.16)			
Channel.SF	2.16	Data Rate	17.6 ksps
Channel Pwr Abs/Rel	-45.28dBm/-16.40dB	Modulation Type	QPSK
Symbol EVM	16.72 % rms	Symbol EVM	27.40 % Pk

Remote command:
CALCulate<n>:FEED on page 128
CALCulate<n>:FEED on page 128

Result Summary (Set: #) ← Result Summary ← Display Configuration
The Result Summary shows results measured over the total signal or a selected set.

- **Chip Rate Error**
  Shows the chip rate error (1.28 Mcps) in ppm. A large chip rate error results in symbol errors and, therefore, in possible synchronization errors for code domain measurements. This measurement result is also valid if the R&S FSV could not synchronize to the TD-SCDMA signal.
- **Trigger to Frame**
  Reflects the time offset from the beginning of the recorded signal section to the start of the first slot. In case of triggered data recording, this corresponds to the timing offset:
  frame trigger (+ trigger offset) - start of first PCG
  If it was not possible to synchronize the R&S FSV to the TD-SCDMA signal, this measurement result is meaningless. For the "Free Run" trigger mode, dashes are displayed.

Slot Result (Slot: #) ← Result Summary ← Display Configuration
The Slot Results show results measured over all channels and one specific slot.

- **P Data**
  Shows the average power of the slot's data parts.
- **P D1/D2**
  Shows the power for each of the slot's data parts.
- **P Midamble**

Shows the power for the slot's midamble.

- **Average RCDE**
  Shows the average RCDE (Relative Code Domain Error). The Average RCDE is calculated according to release 8 of the standard.
- **Active Channels**
  Shows the number of active channels in the slot.
- **Carrier Frequency Error**
  Shows the frequency error referred to the center frequency of the R&S FSV. The absolute frequency error is the sum of the frequency error of the R&S FSV and that of the device under test.
  Frequency differences between the transmitter and receiver of more than 1.0 kHz impair synchronization of the Code Domain Power measurement. If at all possible, the transmitter and the receiver should be synchronized.
- **IQ Imbalance / Offset**
  Shows the IQ imbalance and the DC offset of the signal in %.
- **Rho**
  Shows the quality parameter Rho. According to the TD-SCDMA standard, Rho is the normalized, correlated power between the measured and the ideally generated reference signal. When Rho is measured, the TD-SCDMA standard requires that only the pilot channel be supplied.
- **Composite EVM**
  Shows the Composite EVM of the signal. The Composite EVM is the difference between the test signal and an ideal reference signal.
- **Pk CDE (SF16)**
  Shows the "Peak Code Domain Error" on page 30 of the signal for a spreading factor of 16.

Channel Result (Channel: #) ← Result Summary ← Display Configuration
The Channel Results show results measured over a specific channel in a specific slot.

- **Channel.SF**
  Shows the number of the channel and its spreading factor.
- **Channel Pwr. Abs/Rel**
  Shows the absolute and the relative powers of the channel.
  The relative channel power is in relation to the total power of the data parts of the signal.
- **Symbol EVM**
  Shows the channel's peak and average Error Vector Magnitude.
- **Data Rate**
  Shows the data rate of the channel.
- **Modulation Type**
  Shows the modulation type of the channel.

Channel Table ← Display Configuration
Starts the Channel Table result display.

This result display shows all channels of the signal. The sorting of the channels depends on the Result Settings.

- Sorting by code means that the midambles are listed first, followed by the active data channels. Inactive channels are listed at the end of the table.

The R&S FSV sorts midambles according to their midamble shifts. Active and inactive channels are projected to a SF of 16 and sorted according to their code numbers.

- Sorting by midamble means that after each midamble, the corresponding code is listed. The R&S FSV automatically distinguishes between common and default midamble allocation. The allocation of code to midamble is specified in the TD-SCDMA standard.

If neither a common nor a default midamble allocation is found, sorting is in code order.

The measurement evaluates the total signal over a single slot.

Channel Table ● 1 Clrw

Channel Type	Walsh Ch.SF	DataRate /ksps	Mod	Power /dBm	Power /dB	MA. shift	ΔMiD1 /dB	ΔMiD2 /dB
Midamble	-,-	---	----	-55.85	-25.94	1	-106.5	-106.5
Midamble	-,-	---	----	-60.90	-30.99	2	-106.5	-106.5
Midamble	-,-	---	----	-59.15	-29.24	3	-106.5	-106.5
DPCH	1.16	17.6	QPSK	-35.27	-5.36	---	---	---
DPCH	2.16	17.6	QPSK	-35.25	-5.35	---	---	---
DPCH	2.8	35.2	QPSK	-40.30	-10.39	---	---	---
DPCH	2.2	140.8	QPSK	-35.20	-5.29	---	---	---
---	5.16	---	----	-50.95	-21.04	---	---	---
---	6.16	---	----	-51.60	-21.69	---	---	---

For the Code Domain Power measurement, the following parameters are determined for the channels:

- **Channel Type**
  Shows the channel type.
- **Walsh.SF**
  Channel number including the spreading factor (in the form <Channel>.<SF>).
- **Data Rate/kbps**
  Data rate with which the channel is transmitted. The data rate is between 17.6 ksps and 281.6 ksps for QPSK modulation and between 26.4 and 422.4 ksps for 8PSK modulation.
- **Mod**
  Shows he modulation type (QPSK, 8PSK, 16QAM or 64QAM).
- **Power/dBm**
  Shows the absolute channel power.
- **Power/dB**
  Shows the relative channel power. The relative channel power is in relation to the total power of the data parts of the signal.
- **MA.Shift**
  Shows the midamble shift. For code channels, this is the shift of the associated midamble if a common or default midamble allocation is detected.

The TD-SCDMA specifications require that the midamble and its code channels must have the same power. The following two parameters show if a common or default midamble allocation is detected.

- **ΔMiD1/dB**
  Shows the power offset of the midamble and the sum power of its channels in data part 1.
- **ΔMiD2/dB**

Shows the power offset of the midamble and the sum power of its channels in data part 2.

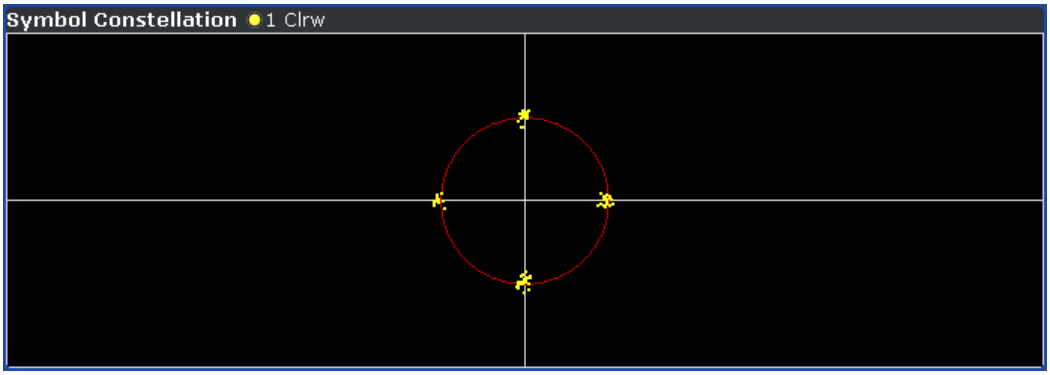
Inactive channels are marked with dashes in the "Channel Type", "DataRate" and "Modulation" columns. When working with predefined channel tables, every code is regarded as active.

Remote command:
CALCulate<n>:FEED on page 128

Channel Constellation ← Display Configuration
Starts the Channel Constellation result display.

This result display shows the channel constellation of the modulated signal at symbol level.

The measurement evaluates a single channel over a single slot.

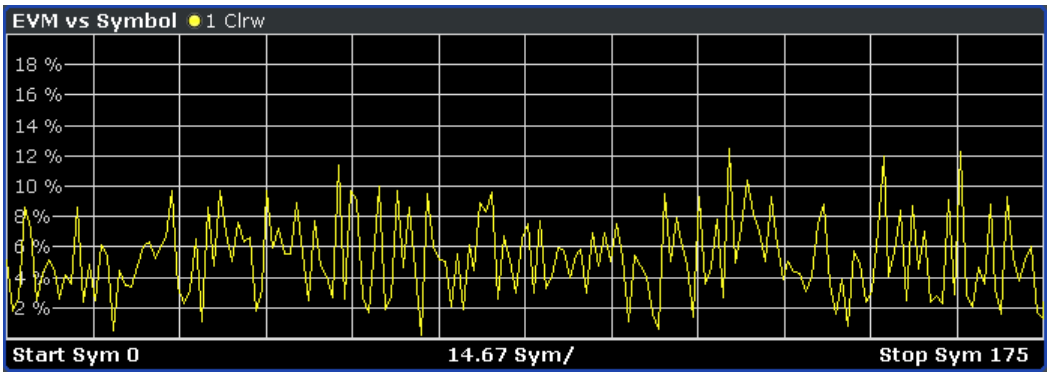


The R&S FSV-K76 supports QPSK, 8PSK, 16QAM and 64QAM modulation types.

Remote command:
CALCulate<n>:FEED on page 128

EVM vs Symbol ← Display Configuration
Starts the Symbol Error Vector Magnitude result display. This result display shows the EVM on symbol level. The x-axis represents the symbols and the y-axis shows the EVM in %.

The measurement evaluates a single channel over a single slot.



The number of symbols is in the range from 44 to 704 and depends on the spreading factor.

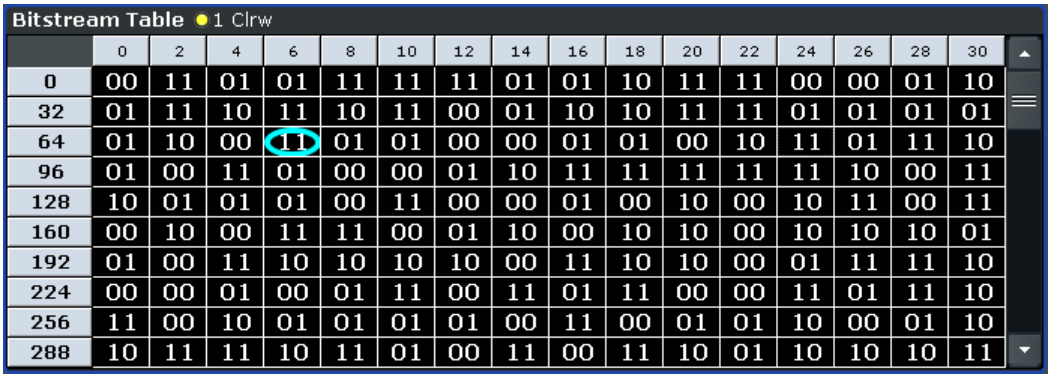
Inactive channels can be measured, but the result is meaningless since these channels do not contain data.

Remote command:
CALCulate<n>:FEED on page 128

Channel Bitstream ← Display Configuration
Starts the Channel Bitstream result display.

The result display provides information on the demodulated bits. All bits that are part of inactive channels are marked as being invalid by means of dashes. For 64QAM modulation '----' is displayed, for 16QAM modulation '---', for 8PSK '--' and for QPSK '-'.

The measurement evaluates a single channel over a single slot.



	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
0	00	11	01	01	11	11	11	01	01	10	11	11	00	00	01	10
32	01	11	10	11	10	11	00	01	10	10	11	11	01	01	01	01
64	01	10	00	11	01	01	00	00	01	01	00	10	11	01	11	10
96	01	00	11	01	00	00	01	10	11	11	11	11	11	10	00	11
128	10	01	01	01	00	11	00	00	01	00	10	00	10	11	00	11
160	00	10	00	11	11	00	01	10	00	10	10	00	10	10	10	01
192	01	00	11	10	10	10	10	00	11	10	10	00	01	11	11	10
224	00	00	01	00	01	11	00	11	01	11	00	00	11	01	11	10
256	11	00	10	01	01	01	01	00	11	00	01	01	10	00	01	10
288	10	11	11	10	11	01	00	11	00	11	10	01	10	10	10	11

Select a specific symbol using the MKR key. If you enter a number, the marker jumps to the selected symbol. If there are more symbols than the screen is capable of displaying, use the marker to scroll inside the list.

Depending on the spreading factor (symbol rate) of the channel, a slot may contain a minimum of 44 and a maximum of 704 symbols. In case of an active transmit diversity (Antenna Diversity) the values reduce to the half. Depending on the modulation type, a symbol consists of the following bits:

- QPSK: 2bits
- 8PSK: 3 bits
- 16QAM: 4 bits
- 64QAM: 6 bits

Remote command:
CALCulate<n>:FEED on page 128

Composite Constellation ← Display Configuration
Starts the Composite Constellation result display.

This result display shows the constellation of the modulated signal at chip level. For each of the 1536 chips, a constellation point is displayed in the diagram.

The measurement evaluates the total signal over a single slot.

Remote command:
CALCulate<n>:FEED on page 128

Select Ch Slot
Opens a dialog box to select a specific channel and / or slot. The results of that channel / slot are then shown in the result display.

Adjust Ref Lvl
Adjusts the reference level to the measured channel power. This ensures that the settings of the RF attenuation and the reference level are optimally adjusted to the signal level without overloading the R&S FSV or limiting the dynamic range by a too small S/N ratio.

For details on manual settings see "Settings of CP/ACLR test parameters" in the description of the base unit.

The reference level is not influenced by the selection of a standard. To achieve an optimum dynamic range, the reference level has to be set in a way that places the signal maximum close to the reference level without forcing an overload message. Since the measurement bandwidth for channel power measurements is significantly lower than the signal bandwidth, the signal path may be overloaded although the trace is still significantly below the reference level.

Remote command:
`[SENSe:]POWer:ACHannel:PRESet:RLEVel` on page 208

3.1.1.2 Softkeys of the Frequency Menu

The following chapter describes all softkeys available in the "Frequency" menu of the TD-SCDMA BTS and UE Measurement Application. It is possible that your instrument configuration does not provide all softkeys. If a softkey is only available with a special option, model or (measurement) mode, this information is delivered in the corresponding softkey description.

This menu contains the following softkeys:

Center....38
Center Stepsize....38
Frequency Offset....39

Center
Opens an edit dialog box to enter the center frequency. The allowed range of values for the center frequency depends on the frequency span.

span > 0: $span_{min}/2 \leq f_{center} \leq f_{max} - span_{min}/2$

span = 0: $0\ Hz \leq f_{center} \leq f_{max}$

f_{max} and $span_{min}$ are specified in the data sheet.

Remote command:
`[SENSe:]FREQuency:CENTer` on page 200

Center Stepsize
This softkey is identical to the "Manual" on page 85 softkey for RF measurements.

This softkey is available for code domain and power vs time measurements.

Frequency Offset
Opens an edit dialog box to enter a frequency offset that shifts the displayed frequency range by the specified offset.

The softkey indicates the current frequency offset. The allowed values range from -100 GHz to 100 GHz. The default setting is 0 Hz.

Remote command:
`[SENSe:]FREQuency:OFFSet` on page 202

3.1.1.3 Softkeys of the Amplitude Menu

The following table shows all softkeys available in the "Amplitude" menu of the TD-SCDMA BTS and UE measurement applications for CDA and Power vs Time measurements. (Note: The softkeys in the "Amplitude" menu for other RF measurements are described in chapter 3.2.7.4, "Softkeys of the Amplitude Menu for RF Measurements", on page 87.)

This menu contains the following softkeys:

Ref Level
Opens an edit dialog box to enter the reference level in the current unit (dBm, dBµV, etc).

The reference level is the maximum value the AD converter can handle without distortion of the measured value. Signal levels above this value will not be measured correctly, which is indicated by the "IFOVL" status display.

Remote command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel` on page 175

Scale
Opens a submenu with the following softkeys:

This softkey and its submenu is available for code domain and Power vs Time measurements.

Auto Scale Once ← Scale
Automatically scales the y-axis of the grid of the selected screen with respect to the measured data.

The softkey is available for code domain measurements.

Remote command:
`DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:AUTO` on page 173

Y-Axis Maximum ← Scale
Opens a dialog box to set the maximum value for the y-axis of the grid of the selected screen.

The softkey is available for code domain measurements.

Remote command:
`DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:MAXimum` on page 173

Y-Axis Minimum ← Scale
Opens a dialog box to set the minimum value for the y-axis of the grid of the selected screen.

The softkey is available for code domain measurements.

Remote command:
`DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:MINimum` on page 174

Ref Level Offset
Opens an edit dialog box to enter the arithmetic level offset. This offset is added to the measured level irrespective of the selected unit. The scaling of the y-axis is changed accordingly. The setting range is ±200 dB in 0.1 dB steps.

Remote command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet` on page 175

Preamp On/Off
Switches the preamplifier on and off.

If option R&S FSV-B22 is installed, the preamplifier is only active below 7 GHz.

If option R&S FSV-B24 is installed, the preamplifier is active for all frequencies.

This function is not available for input from the R&S Digital I/Q Interface (option R&S FSV-B17).

Remote command:
`INPut:GAIN:STATe` on page 230

RF Atten Manual/Mech Att Manual
Opens an edit dialog box to enter the attenuation, irrespective of the reference level. If electronic attenuation is activated (option R&S FSV-B25 only; "El Atten Mode Auto" softkey), this setting defines the mechanical attenuation.

The mechanical attenuation can be set in 10 dB steps.

The RF attenuation can be set in 5 dB steps (with option R&S FSV-B25: 1 dB steps). The range is specified in the data sheet. If the current reference level cannot be set for the set RF attenuation, the reference level is adjusted accordingly.

This function is not available for input from the R&S Digital I/Q Interface (option R&S FSV-B17).

The RF attenuation defines the level at the input mixer according to the formula:

$level_{mixer} = level_{input} – RF\ attenuation$

Note: As of firmware version 1.61, the maximum mixer level allowed is **0 dBm**. Mixer levels above this value may lead to incorrect measurement results, which are indicated by the "OVLD" status display. The increased mixer level allows for an improved signal, but also increases the risk of overloading the instrument!

Remote command:
`INPut:ATTenuation` on page 225

RF Atten Auto/Mech Att Auto
Sets the RF attenuation automatically as a function of the selected reference level. This ensures that the optimum RF attenuation is always used. It is the default setting.

This function is not available for input from the R&S Digital I/Q Interface (option R&S FSV-B17).

Remote command:
INPut:ATTenuation:AUTO on page 225

El Atten On/Off
This softkey switches the electronic attenuator on or off. This softkey is only available with option R&S FSV-B25.

When the electronic attenuator is activated, the mechanical and electronic attenuation can be defined separately. Note however, that both parts must be defined in the same mode, i.e. either both manually, or both automatically.

This function is not available for input from the R&S Digital I/Q Interface (option R&S FSV-B17).

- To define the mechanical attenuation, use the RF Atten Manual/Mech Att Manual or RF Atten Auto/Mech Att Auto softkeys.
- To define the electronic attenuation, use the El Atten Mode (Auto/Man) softkey.

Note: This function is not available for stop frequencies (or center frequencies in zero span) >7 GHz. In this case, the electronic and mechanical attenuation are summarized and the electronic attenuation can no longer be defined individually. As soon as the stop or center frequency is reduced below 7 GHz, this function is available again.
When the electronic attenuator is switched off, the corresponding RF attenuation mode (auto/manual) is automatically activated.

Remote command:
INPut:EATT:AUTO on page 230

El Atten Mode (Auto/Man)
This softkey defines whether the electronic attenuator value is to be set automatically or manually. If manual mode is selected, an edit dialog box is opened to enter the value. This softkey is only available with option R&S FSV-B25, and only if the electronic attenuator has been activated via the El Atten On/Off softkey.

Note: This function is not available for stop frequencies (or center frequencies in zero span) >7 GHz. In this case, the electronic and mechanical attenuation are summarized and the electronic attenuation can no longer be defined individually. As soon as the stop or center frequency is reduced below 7 GHz, electronic attenuation is available again. If the electronic attenuation was defined manually, it must be re-defined.

The attenuation can be varied in 1 dB steps from 0 to 30 dB. Other entries are rounded to the next lower integer value.

To re-open the edit dialog box for manual value definition, select the "Man" mode again.

If the defined reference level cannot be set for the given RF attenuation, the reference level is adjusted accordingly and the warning "Limit reached" is output.

Remote command:
INPut:EATT:AUTO on page 230
INPut:EATT on page 229

Input (AC/DC)
Toggles the RF input of the R&S FSV between AC and DC coupling.

This function is not available for input from the R&S Digital I/Q Interface (option R&S FSV-B17).

Remote command:
INPut:COUPling on page 226

3.1.1.4 Softkeys of the Auto Set Menu

The following chapter describes all softkeys available in the "Auto Set" menu of the TD-SCDMA BTS and UE Measurement Applications for CDA measurements.

For RF measurements, see the description for the base unit.

Auto All
Performs all automatic settings.

- "Auto Freq" on page 42
- "Auto Level" on page 42

Remote command:
[SENSe:]ADJust:ALL on page 184

Auto Freq
Defines the center frequency automatically by determining the highest frequency level in the frequency span. This function uses the signal counter; thus it is intended for use with sinusoidal signals.

This function is not available for input from the R&S Digital I/Q Interface (option R&S FSV-B17).

Remote command:
[SENSe:]ADJust:FREQuency on page 185

Auto Level
Defines the optimal reference level for the current measurement automatically.

The measurement time for automatic leveling can be defined using the Settings softkey.

Remote command:
[SENSe:]ADJust:LEVel on page 186

Settings
Opens a submenu to define settings for automatic leveling.

Possible settings are:

- "Meas Time Manual" on page 42
- "Meas Time Auto" on page 43

Meas Time Manual ← Settings
Opens an edit dialog box to enter the duration of the level measurement in seconds. The level measurement is used to determine the optimal reference level automatically (see the "Auto Level" softkey, "Auto Level" on page 42). The default value is 1 ms.

Remote command:
[SENSe:]ADJust:CONFigure:LEVel:DURation on page 185

Meas Time Auto ← Settings
The level measurement is used to determine the optimal reference level automatically (see the Auto Level softkey).

This softkey resets the level measurement duration for automatic leveling to the default value of 100 ms.

Upper Level Hysteresis ← Settings
Defines an upper threshold the signal must exceed before the reference level is automatically adjusted when the "Auto Level" function is performed.

Remote command:
`[SENSe:]ADJust:CONFiguration:HYSTeresis:UPPer` on page 184

Lower Level Hysteresis ← Settings
Defines a lower threshold the signal must exceed before the reference level is automatically adjusted when the "Auto Level" function is performed.

Remote command:
`[SENSe:]ADJust:CONFiguration:HYSTeresis:LOWer` on page 184

3.1.1.5 Softkeys of the Sweep Menu

The following table shows all softkeys available in the "Sweep" menu of the TD-SCDMA BTS and UE Measurement Application for CDA measurements. For all other measurements, the softkeys are described in chapter 3.2.7.6, "Softkeys of the Sweep Menu", on page 99.

Continuous Sweep....43
Single Sweep....43
Continue Single Sweep....44
Sweep Count....44

Continuous Sweep
Sets the continuous sweep mode: the sweep takes place continuously according to the trigger settings. This is the default setting.

The trace averaging is determined by the sweep count value (see the "Sweep Count" softkey, "Sweep Count" on page 44).

Remote command:
`INIT:CONT ON`, see `INITiate<n>:CONTinuous` on page 235

Single Sweep
Sets the single sweep mode: after triggering, starts the number of sweeps that are defined by using the Sweep Count softkey. The measurement stops after the defined number of sweeps has been performed.

Remote command:
`INIT:CONT OFF`, see `INITiate<n>:CONTinuous` on page 235

Continue Single Sweep
Repeats the number of sweeps set by using the Sweep Count softkey, without deleting the trace of the last measurement.

This is particularly of interest when using the trace configurations "Average" or "Max Hold" to take previously recorded measurements into account for averaging/maximum search.

Remote command:
`INITiate<n>:CONMeas` on page 235

Sweep Count
Opens an edit dialog box to enter the number of sweeps to be performed in the single sweep mode. Values from 0 to 32767 are allowed. If the values 0 or 1 are set, one sweep is performed. The sweep count is applied to all the traces in a diagram.

If the trace configurations "Average", "Max Hold" or "Min Hold" are set, the sweep count value also determines the number of averaging or maximum search procedures.

In continuous sweep mode, if sweep count = 0 (default), averaging is performed over 10 sweeps. For sweep count =1, no averaging, maxhold or minhold operations are performed.

Remote command:
`[SENSe:]SWEep:COUNt` on page 212

3.1.1.6 Softkeys of the Trace Menu for CDA Measurements

The following list shows all softkeys available in the "Trace" menu of the "TD-SCDMA BTS" and UE measurement applications for Code Domain Analysis measurements.

For RF measurements, see the description for the base unit.

Clear Write....44
Max Hold....44
Min Hold....45
Average....45
View....45

Clear Write
Overwrite mode: the trace is overwritten by each sweep. This is the default setting.

All available detectors can be selected.

Remote command:
`DISP:TRAC:MODE WRIT`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 172

Max Hold
The maximum value is determined over several sweeps and displayed. The R&S FSV saves the sweep result in the trace memory only if the new value is greater than the previous one.

The detector is automatically set to "Positive Peak".

This mode is especially useful with modulated or pulsed signals. The signal spectrum is filled up upon each sweep until all signal components are detected in a kind of envelope.

This mode is not available for statistics measurements.

Remote command:
`DISP:TRAC:MODE MAXH`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 172

Min Hold
The minimum value is determined from several measurements and displayed. The R&S FSV saves the smallest of the previously stored/currently measured values in the trace memory.

The detector is automatically set to "Negative Peak".

This mode is useful e.g. for making an unmodulated carrier in a composite signal visible. Noise, interference signals or modulated signals are suppressed whereas a CW signal is recognized by its constant level.

This mode is not available for statistics measurements.

Remote command:
`DISP:TRAC:MODE MINH`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 172

Average
The average is formed over several sweeps. The Sweep Count determines the number of averaging procedures.

All available detectors can be selected. If the detector is automatically selected, the sample detector is used (see chapter 3.3.1, "Detector Overview", on page 104).

This mode is not available for statistics measurements.

Remote command:
`DISP:TRAC:MODE AVER`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 172

View
The current contents of the trace memory are frozen and displayed.

Note: If a trace is frozen, the instrument settings, apart from level range and reference level (see below), can be changed without impact on the displayed trace. The fact that the displayed trace no longer matches the current instrument setting is indicated by the ★ icon on the tab label.

If the level range or reference level is changed, the R&S FSV automatically adapts the measured data to the changed display range. This allows an amplitude zoom to be made after the measurement in order to show details of the trace.

Remote command:
`DISP:TRAC:MODE VIEW`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 172

3.1.1.7 Softkeys of the Trigger Menu for CDA Measurements

The following list shows all softkeys available in the "Trigger" menu of the "TD-SCDMA BTS" and "UE" measurement applications for Code Domain Analysis measurements.

For RF measurements, see the description for the base unit.

Trigger Source Free Run
The start of a sweep is not triggered. Once a measurement is completed, another is started immediately.

This softkey is available for code domain measurements.

Remote command:
`TRIG:SOUR IMM`, see `TRIGger<n>[:SEQuence]:SOURce` on page 233

Trigger Source External
Defines triggering via a TTL signal at the "EXT TRIG/GATE IN" input connector on the rear panel.

An edit dialog box is displayed to define the external trigger level.

This softkey is available for code domain measurements.

Remote command:
`TRIG:SOUR EXT`, see `TRIGger<n>[:SEQuence]:SOURce` on page 233

Trg/Gate Polarity
Sets the polarity of the trigger/gate source.

The sweep starts after a positive or negative edge of the trigger signal. The default setting is "Pos". The setting applies to all trigger modes with the exception of the "Free Run", "Power Sensor" and "Time" mode.

This softkey is available for RF measurements.

For details also see "Using Gated Sweep Operation" in the base unit description.

"Pos" Level triggering: the sweep is stopped by the logic "0" signal and restarted by the logical "1" signal after the gate delay time has elapsed.

"Neg" Edge triggering: the sweep is continued on a "0" to "1" transition for the gate length duration after the gate delay time has elapsed.

Remote command:
`TRIGger<n>[:SEQuence]:SLOPe` on page 233

Trigger Offset
Opens an edit dialog box to enter the time offset between the trigger signal and the start of the sweep.

offset > 0:	Start of the sweep is delayed
offset < 0:	Sweep starts earlier (pre-trigger) Only possible for span = 0 (e.g. I/Q Analyzer mode) and gated trigger switched off Maximum allowed range limited by the sweep time: $pretrigger_{max}$ = sweep time When using the R&S Digital I/Q Interface (R&S FSV-B17) with I/Q Analyzer mode, the maximum range is limited by the number of pretrigger samples. See the R&S Digital I/Q Interface(R&S FSV-B17) description in the base unit.

In the "External" or "IF Power" trigger mode, a common input signal is used for both trigger and gate. Therefore, changes to the gate delay will affect the trigger delay (trigger offset) as well.

Remote command:
`TRIGger<n>[:SEQuence]:HOLDoff[:TIME]` on page 232

3.1.1.8 Softkeys of the Input/Output Menu for CDA Measurements

The following chapter describes all softkeys available in the "Input/Output" menu for CDA measurements. For RF measurements, see chapter 3.2.7.7, "Softkeys of the Input/Output Menu for RF Measurements", on page 102.

Input (AC/DC) 47
Noise Source 48
Signal Source 48
- Input Path 48
- Connected Device 48
- Input Sample Rate 48
- Full Scale Level 48
- Level Unit 48
- Adjust Reference Level to Full Scale Level 49

Digital IQ Info 49
EXIQ 49
- TX Settings 49
- RX Settings 49
- Send To 49
- Firmware Update 50
- R&S Support 50
- DigIConf 50

Input (AC/DC)
Toggles the RF input of the R&S FSV between AC and DC coupling.

This function is not available for input from the R&S Digital I/Q Interface (option R&S FSV-B17).

Remote command:
`INPut:COUPling` on page 226

Noise Source
Switches the supply voltage for an external noise source on or off. For details on connectors refer to the R&S FSV Quick Start Guide, "Front and Rear Panel" chapter.

Remote command:
DIAGnostic<n>:SERVice:NSOurce on page 234

Signal Source
Opens a dialog box to select the signal source.

For "Digital Baseband (I/Q)", the source can also be configured here.

Input Path ← Signal Source
Defines whether the "RF Radio Frequency" or the "Digital IQ" input path is used for measurements. "Digital IQ" is only available if option R&S FSV-B17 (R&S Digital I/Q Interface) is installed.

Note: Note that the input path defines the characteristics of the signal, which differ significantly between the RF input and digital input.

Remote command:
INPut:SELect on page 231

Connected Device ← Signal Source
Displays the name of the device connected to the optional R&S Digital I/Q Interface (R&S FSV-B17) to provide Digital IQ input. The device name cannot be changed here.

The device name is unknown.

Remote command:
INPut:DIQ:CDEVice on page 226

Input Sample Rate ← Signal Source
Defines the sample rate of the digital I/Q signal source. This sample rate must correspond with the sample rate provided by the connected device, e.g. a generator.

Remote command:
INPut:DIQ:SRATe on page 228

Full Scale Level ← Signal Source
The "Full Scale Level" defines the level that should correspond to an I/Q sample with the magnitude "1".

The level can be defined either in dBm or Volt.

Remote command:
INPut:DIQ:RANGe[:UPPer] on page 228

Level Unit ← Signal Source
Defines the unit used for the full scale level.

Remote command:
INPut:DIQ:RANGe[:UPPer]:UNIT on page 228

Adjust Reference Level to Full Scale Level ← Signal Source
If enabled, the reference level is adjusted to the full scale level automatically if any change occurs.

Remote command:
`INPut:DIQ:RANGe:COUPling` on page 227

Digital IQ Info
Displays a dialog box with information on the digital I/Q input and output connection via the optional R&S Digital I/Q Interface (R&S FSV-B17), if available. The information includes:

- Device identification
- Used port
- (Maximum) digital input/output sample rates and maximum digital input/output transfer rates
- Status of the connection protocol
- Status of the PRBS descewing test

For details see "Interface Status Information" in "Instrument Functions - R&S Digital I/Q Interface (Option R&S FSV-B17)" in the description of the base unit.

Remote command:
`INPut:DIQ:CDEVice` on page 226

EXIQ
Opens a configuration dialog box for an optionally connected R&S EX-IQ-BOX and a submenu to access the main settings quickly.

Note: The EX-IQ-Box functionality is not supported for R&S FSV models 1321.3008Kxx.

If the optional R&S DigIConf software is installed, the submenu consists only of one key to access the software. **Note that R&S DigIConf requires a USB connection (not LAN!) from the R&S FSV to the R&S EX-IQ-BOX in addition to the R&S Digital I/Q Interface connection. R&S DigIConf version 2.10 or higher is required.**

For typical applications of the R&S EX-IQ-BOX see also the description of the R&S Digital I/Q Interface (R&S FSV-B17) in the base unit manual.

For details on configuration see the "R&S®Ex I/Q Box - External Signal Interface Module Manual".

For details on installation and operation of the R&S DigIConf software, see the "R&S®EX-IQ-BOX Digital Interface Module R&S®DigIConf Software Operating Manual".

TX Settings ← EXIQ
Opens the "EX-IQ-BOX Settings" dialog box to configure the R&S FSV for digital output to a connected device ("Transmitter" Type).

RX Settings ← EXIQ
Opens the "EX-IQ-BOX Settings" dialog box to configure the R&S FSV for digital input from a connected device ("Receiver" Type).

Send To ← EXIQ
The configuration settings defined in the dialog box are transferred to the R&S EX-IQ-BOX.

Firmware Update ← EXIQ
If a firmware update for the R&S EX-IQ-BOX is delivered with the R&S FSV firmware, this function is available. In this case, when you select the softkey, the firmware update is performed.

R&S Support ← EXIQ
Stores useful information for troubleshooting in case of errors.

This data is stored in the `C:\R_S\Instr\user\Support` directory on the instrument.

If you contact the Rohde&Schwarz support to get help for a certain problem, send these files to the support in order to identify and solve the problem faster.

DigIConf ← EXIQ
Starts the optional R&S DigIConf application. This softkey is only available if the optional software is installed.

To return to the R&S FSV application, press any key on the front panel. The application is displayed with the "EXIQ" menu, regardless of which key was pressed.

For details on the R&S DigIConf application, see the "R&S®EX-IQ-BOX Digital Interface Module R&S®DigIConf Software Operating Manual".

Note: If you close the R&S DigIConf window using the "Close" icon, the window is minimized, not closed.
If you select the "File > Exit" menu item in the R&S DigIConf window, the application is closed. Note that in this case the settings are lost and the EX-IQ-BOX functionality is no longer available until you restart the application using the "DigIConf" softkey in the R&S FSV once again.

Remote command:
Remote commands for the R&S DigIConf software always begin with `SOURce:EBOX`.
Such commands are passed on from the R&S FSV to the R&S DigIConf automatically which then configures the R&S EX-IQ-BOX via the USB connection.
All remote commands available for configuration via the R&S DigIConf software are described in the "R&S®EX-IQ-BOX Digital Interface Module R&S®DigIConf Software Operating Manual".
Example 1:
```
SOURce:EBOX:*RST
SOURce:EBOX:*IDN?
```
Result:
"Rohde&Schwarz,DigIConf,02.05.436 Build 47"
Example 2:
```
SOURce:EBOX:USER:CLOCk:REFerence:FREQuency 5MHZ
```
Defines the frequency value of the reference clock.

3.2 RF Measurements

3.2.1 Signal Channel Power

The Signal Channel Power measurement analyses the power of the RF signal. One trace shows the evaluation of a single channel with a bandwidth of 1.2288 MHz. The results are based on the root mean square.

Below the measurement screen the bandwidth and associated channel power are displayed. The other screen elements match those of the spectrum analyzer in the base unit.

The configuration of the measurement and the default settings comply to the TD-SCDMA requirements.

Parameter	Default Value
Frequency Span	3 MHz
Measurement BW	1.6 MHz
Number of adjacent channels	0
Adjacent Channel Power	On

For details on the softkeys of the Signal Channel Power measurement refer to the Power softkey in the "Measurement" menu.

3.2.2 Adjacent Channel Power (CH Power ACLR)

The Adjacent Channel Power measurement analyses the power of the TX channel and the power of adjacent and alternate channels on the left and right side of the TX channel. The number of TX channels and adjacent channels can be modified as well as the band class.

Below the measurement screens the bandwidth and power of the TX channel and the bandwidth, spacing and power of the adjacent and alternate channels are displayed. The other screen elements match those of the spectrum analyzer in the base unit.

The configuration of the measurement and the default settings comply to the TD-SCDMA requirements.

Parameter	Default Value
Adjacent Channel Power	On
ACP Standard	TD-SCDMA
Number of Adjacent Channels	2

For details on the softkeys of the Adjacent Channel Power measurement refer to the Ch Power ACLR softkey in the "Measurement" menu.

3.2.3 Spectrum Emission Mask

The Spectrum Emission Mask measurement shows the quality of the measured signal by comparing the power values in the frequency range near the carrier against a spectral mask that is defined by the 3GPP2 specifications. The limits depend on the selected bandclass. In this way, the performance of the DUT can be tested and the emissions and their distance to the limit be identified.

Note that the standard does not distinguish between spurious and spectral emissions.

Below the measurement screen a table showing the peak list. In the peak list the values for the worst spectral emissions are displayed including their frequency and power.

The default settings of the Spectrum Emission Mask measurement are listed in the table below.

Parameter	Default Value
Frequency Span	8 MHz
Sweep Time	20 ms
Detector	RMS

For details on the softkeys of the Spectrum Emission Mask measurement refer to the Spectrum Emission Mask softkey in the "Measurement" menu.

3.2.4 Occupied Bandwidth

The Occupied Bandwidth measurement determines the bandwidth in which the signal power can be found. By default the bandwidth is displayed in which 99% of the signal is found. The percentage of the signal power included in the measurement can be modified. In the top right corner of the screen, the bandwidth and frequency markers are displayed.

The default settings of the Occupied Bandwidth measurement are listed in the table below.

Parameter	Default Value
Occupied Bandwidth	ON
Frequency Span	4.8 MHz
Sweep Time	1.3 s
RBW	30 kHz
VBW	300 kHz
Detector	RMS

For details on the softkeys of the Occupied Bandwidth measurement refer to the Occupied Bandwidth softkey in the "Measurement" menu.

3.2.5 Complementary Cumulative Distribution Function (CCDF)

The CCDF measurement displays the CCDF and the Crest Factor. The CCDF shows distribution of the signal amplitudes. For the measurement, a signal section of settable length is recorded continuously in a zero span. The measurement is useful to determine errors of linear amplifiers. The Crest factor is defined as the ratio of the peak power and the mean power. Beneath the measurement screen a table containing the number of included samples, mean and peak power and the Crest factor is displayed.

The default settings of the CCDF measurement are listed in the table below.

Parameter	Default Value
CCDF	On
RBW	10 MHz
Detector	Sample

For details on the softkeys of the CCDF measurement refer to the CCDF softkey in the "Measurement" menu.

3.2.6 Power vs Time

The Power vs Time measurement determines the start of the subframe and compares the averaged power in time domain against a transmit On/Off mask according to the specification.

The scaling of the x-axis and therefore also the scaling of the limit line are defined by the Switching Point. Below the measurement screen you can view a list of the measured data.

Parameter	Default Value
Span	Zero Span
Sweep Time	2.4 ms
RBW	1.28 MHz
VBW	10 MHz
Trace Mode	Average

For details on the softkeys of the Power vs Time measurement refer to the Power vs Time softkey in the "Measurement" menu.

3.2.7 Softkeys and Menus for RF Measurements (K76/K77)

The following chapter describes the softkeys and menus available for RF measurements in 3GPP TD-SCDMA BTS and UE Measurement Applications.

All menus not described here are the same as for the base unit, see the description there.

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3.2.7.2 Softkeys of the Frequency Menu....83
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3.2.7.4 Softkeys of the Amplitude Menu for RF Measurements....87
3.2.7.5 Softkeys of the Bandwidth Menu....92
3.2.7.6 Softkeys of the Sweep Menu....99
3.2.7.7 Softkeys of the Input/Output Menu for RF Measurements....102

3.2.7.1 Softkeys of the Measurement Menu

The TD-SCDMA BTS and UE Measurement Applications provide the various test measurements and result displays. All measurements are accessed via the MEAS key.

The following list shows all softkeys available in the "Measurement" menu of the TD-SCDMA BTS and UE Measurement Application. It is possible that your instrument configuration does not provide all softkeys. If a softkey is only available with a special option, model or (measurement) mode, this information is delivered in the corresponding softkey description.

Behaviour of the MEAS CONFIG key

The MEAS CONFIG key always returns to the root menu of the currently active measurement.

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└ Switching Point....82
└ Start Meas....82
└ No of Subframes....82
└ List Evaluation....83
└ Auto Level & Time....83

Code Domain Analyzer
Opens the submenu to configure a code domain analysis. The menu is described in chapter 3.1.1.1, "Softkeys of the Code Domain Analyzer", on page 16.

For details on Code Domain Analysis, see chapter 3.1, "Code Domain Analysis", on page 14.

Power
Starts the Signal Channel Power measurement, in which the power of a single channel is determined.

For details on screen layout and default values, refer to the description of the Signal Channel Power.

Remote command:
`CONFigure:CDPower[:BTS]:MEASurement` on page 169
`CALCulate<n>:MARKer:FUNCtion:CDPower[:BTS]:RESult?` on page 130

Adapt to Signal ← Power
Opens a submenu to configure the measurEment with the following softkeys:

Auto Level & Time ← Adapt to Signal ← Power
The Auto Level and Time softkey automatically adjusts the reference level and the trigger to frame time to their optimum levels. This prevents overloading of the R&S FSV.

Current measurements are aborted when pressing the softkey and resumed after the automatic level detection is finished.

Remote command:
`[SENSe:]POWer:ACHannel:AUTO:LTIMe` on page 183

Start Slot ← Adapt to Signal ← Power
Sets the first slot of the measurement.

Remote command:
`[SENSe:]POWer:ACHannel:SLOT:STarT` on page 183

Stop Slot ← Adapt to Signal ← Power
Sets the last slot of the measurement.

Remote command:
`[SENSe:]POWer:ACHannel:SLOT:STOP` on page 183

Ch Power ACLR
Starts the Adjacent Channel Power measurement.

In this measurement the power of the carrier and its adjacent and alternate channels is determined. For details on screen layout and default values see the description of the Adjacent Channel Power (CH Power ACLR).

Also opens the Adjacent Channel Power submenu.

Remote command:
`CONFigure:CDPower[:BTS]:MEASurement` on page 169
`CALCulate<n>:MARKer:FUNCtion:CDPower[:BTS]:RESult?` on page 130

CP/ACLR Settings ← Ch Power ACLR
Opens a submenu to configure the channel power and adjacent channel power measurement independently of the predefined standards (for details see also chapter 3.3.10, "Predefined CP/ACLR Standards", on page 120 and chapter 3.3.11, "Optimized Settings for CP/ACLR Test Parameters", on page 122).

# of TX Chan ← CP/ACLR Settings ← Ch Power ACLR
Opens an edit dialog box to enter the number of carrier signals to be taken into account in channel and adjacent-channel power measurements. Values from 1 to 18 are allowed.

Remote command:
`[SENSe:]POWer:ACHannel:TXCHannel:COUNt` on page 210

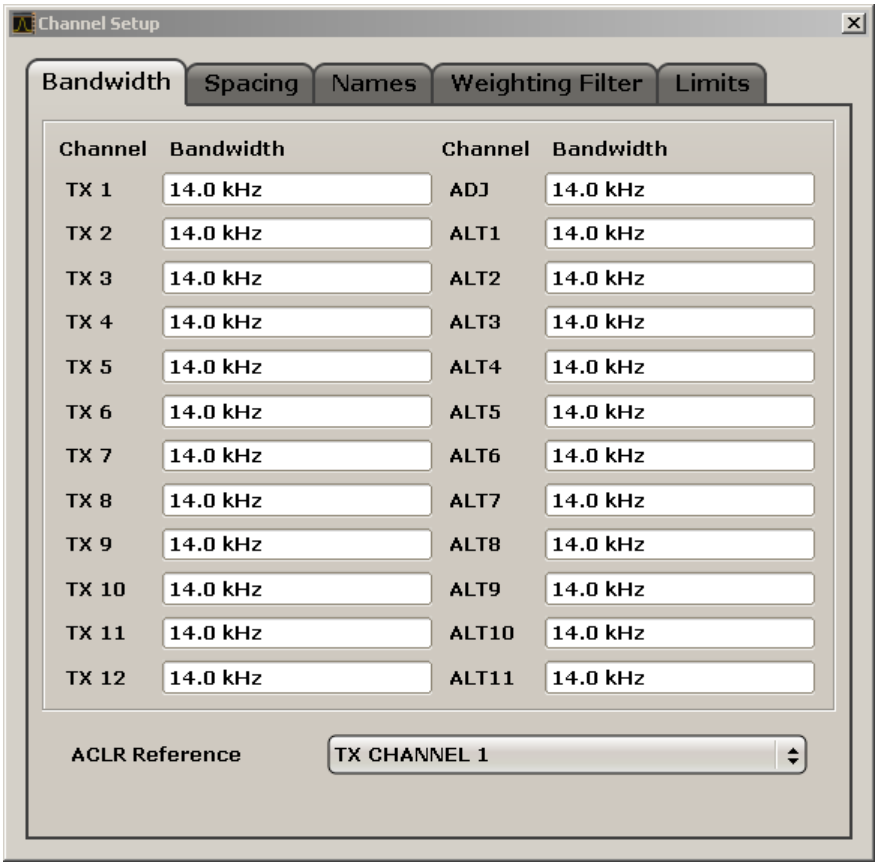
# of Adj Chan ← CP/ACLR Settings ← Ch Power ACLR
Opens an edit dialog box to enter the number of adjacent channels to be considered in the adjacent-channel power measurement. Values from 0 to 12 are allowed.

The following measurements are performed depending on the number of the channels:

0	Only the channel powers are measured.
1	The channel powers and the power of the upper and lower adjacent channel are measured.
2	The channel powers, the power of the upper and lower adjacent channel, and of the next higher and lower channel (alternate channel 1) are measured.
3	The channel power, the power of the upper and lower adjacent channel, the power of the next higher and lower channel (alternate channel 1), and of the next but one higher and lower adjacent channel (alternate channel 2) are measured.
…	…
12	The channel power, the power of the upper and lower adjacent channel, and the power of the all higher and lower channels (alternate channel 1 to 11) are measured.

Remote command:
`[SENSe:]POWer:ACHannel:ACPairs` on page 203

Channel Setup ← CP/ACLR Settings ← Ch Power ACLR
Opens a dialog to define the channel settings for all channels, independant of the defined number of *used* TX or adjacent channels.



The dialog contains the following tabs:

- "Bandwidth" on page 59
- "Spacing" on page 60
- "Names" on page 61
- "Weighting Filter" on page 61
- "Limits" on page 62

Bandwidth ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR
Define the channel bandwidths for the transmission channels and the adjacent channels. "TX" is only available for the multi-carrier ACLR measurement. When you change the bandwidth for one channel, the value is automatically also defined for all subsequent channels of the same type.

The transmission-channel bandwidth is normally defined by the transmission standard. The correct bandwidth is set automatically for the selected standard (see chapter 3.3.11, "Optimized Settings for CP/ACLR Test Parameters", on page 122).

- Measurements in zero span (see Fast ACLR (On/Off) softkey) are performed in the zero span mode. The channel limits are indicated by vertical lines. For measurements requiring channel bandwidths deviating from those defined in the selected standard the IBW method is to be used.
- With the IBW method (see Fast ACLR (On/Off) softkey), the channel bandwidth limits are marked by two vertical lines right and left of the channel center frequency. Thus you can visually check whether the entire power of the signal under test is within the selected channel bandwidth.

If measuring according to the IBW method ("Fast ACLR Off"), the bandwidths of the different adjacent channels are to be entered numerically. Since all adjacent channels often have the same bandwidth, the other alternate channels are set to the bandwidth of the adjacent channel when it is changed. Thus, only one value needs to be entered in case of equal adjacent channel bandwidths.

For details on available channel filters see chapter 3.3.3, "Selecting the Appropriate Filter Type", on page 107.

Remote command:
`[SENSe:]POWer:ACHannel:BANDwidth|BWIDth[:CHANnel<channel>]`
on page 203
`[SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ACHannel` on page 204
`[SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ALTernate<channel>`
on page 204

ACLR Reference ← Bandwidth ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR
Select the transmission channel to which the relative adjacent-channel power values should be referenced.

TX Channel 1	Transmission channel 1 is used.
Min Power TX Channel	The transmission channel with the lowest power is used as a reference channel.
Max Power TX Channel	The transmission channel with the highest power is used as a reference channel.
Lowest & Highest Channel	The outer left-hand transmission channel is the reference channel for the lower adjacent channels, the outer right-hand transmission channel that for the upper adjacent channels.

Remote command:
`[SENSe:]POWer:ACHannel:REFerence:TXCHannel:MANual` on page 209
`[SENSe:]POWer:ACHannel:REFerence:TXCHannel:AUTO` on page 208

Spacing ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR
Define the channel spacings for the TX channels and for the adjacent channels.

- TX channels (left column)

TX1-2	spacing between the first and the second carrier
TX2-3	spacing between the second and the third carrier
…	…

The spacings between all adjacent TX channels can be defined separately. When you change the spacing for one channel, the value is automatically also defined for all subsequent TX channels in order to set up a system with equal TX channel spacing quickly. For different spacings, a setup from top to bottom is necessary.

If the spacings are not equal, the channel distribution according to the center frequency is as follows:

Odd number of TX channels	The middle TX channel is centered to center frequency.
Even number of TX channels	The two TX channels in the middle are used to calculate the frequency between those two channels. This frequency is aligned to the center frequency.

- Adjacent channels (right column)
  Since all the adjacent channels often have the same distance to each other, the modification of the adjacent-channel spacing (ADJ) causes a change in all higher adjacent-channel spacings (ALT1, ALT2, …): they are all multiplied by the same factor (new spacing value/old spacing value). Thus only one value needs to be entered in case of equal channel spacing. A modification of a higher adjacent-channel spacing (ALT1, ALT2, …) causes a change by the same factor in all higher adjacent-channel spacings, while the lower adjacent-channel spacings remain unchanged.
  Example:
  In the default setting, the adjacent channels have the following spacing: 20 kHz ("ADJ"), 40 kHz ("ALT1"), 60 kHz ("ALT2"), 80 kHz ("ALT3"), 100 kHz ("ALT4"), …
  If the spacing of the first adjacent channel ("ADJ") is set to 40 kHz, the spacing of all other adjacent channels is multiplied by factor 2 to result in 80 kHz ("ALT1"), 120 kHz ("ALT2"), 160 kHz ("ALT3"), …
  If, starting from the default setting, the spacing of the 5th adjacent channel ("ALT4") is set to 150 kHz, the spacing of all higher adjacent channels is multiplied by factor 1.5 to result in 180 kHz ("ALT5"), 210 kHz ("ALT6"), 240 kHz ("ALT7"), …
  If a ACLR or MC-ACLR measurement is started, all settings according to the standard including the channel bandwidths and channel spacings are set and can be adjusted afterwards.

Remote command:
`[SENSe:]POWer:ACHannel:SPACing:CHANnel<channel>` on page 210
`[SENSe:]POWer:ACHannel:SPACing[:ACHannel]` on page 209
`[SENSe:]POWer:ACHannel:SPACing:ALTernate<channel>` on page 210

Names ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR
Define user-specific channel names for each channel. The names defined here are displayed in the result diagram and result table.

Remote command:
`[SENSe:]POWer:ACHannel:NAME:ACHannel` on page 207
`[SENSe:]POWer:ACHannel:NAME:ALTernate<channel>` on page 207
`[SENSe:]POWer:ACHannel:NAME:CHANnel<channel>` on page 207

Weighting Filter ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR
Define weighting filters for all channels. Weighting filters are not available for all supported standards and cannot always be defined manually where they are available.

The dialog contains the following fields:

Field	Description
Channel	• TX 1-18: TX channels • ADJ: Adjacent channel • ALT1-11: Alternate channels
Active	Activates/Deactivates the weighting filter for the selected and any subsequent channels of the same type
Alpha	Defines the alpha value for the weighting filter for the selected and any subsequent channels of the same type

Remote command:
`POW:ACH:FILT:CHAN1 ON`, see `[SENSe:]POWer:ACHannel:FILTer[:STATe]:CHANnel<channel>` on page 206
Activates the weighting filter for TX channel 1.
`POW:ACH:FILT:ALPH:CHAN1 0,35` see `[SENSe:]POWer:ACHannel:FILTer:ALPHa:CHANnel<channel>` on page 205
Sets the alpha value for the weighting filter for TX channel 1 to 0,35.
`POW:ACH:FILT:ACH ON` see `[SENSe:]POWer:ACHannel:FILTer[:STATe]:ACHannel` on page 205
Activates the weighting filter for the adjacent channel.
`POW:ACH:FILT:ALPH:ACH 0,35` see `[SENSe:]POWer:ACHannel:FILTer:ALPHa:ACHannel` on page 205
Sets the alpha value for the weighting filter for the adjacent channel to 0,35.
`POW:ACH:FILT:ALT1 ON` see `[SENSe:]POWer:ACHannel:FILTer[:STATe]:ALTernate<channel>` on page 206
Activates the alpha value for the weighting filter for the alternate channel 1.
`POW:ACH:FILT:ALPH:ALT1 0,35` see `[SENSe:]POWer:ACHannel:FILTer:ALPHa:ALTernate<channel>` on page 205
Sets the alpha value for the weighting filter for the alternate channel 1 to 0,35.

Limits ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR
Activate and define the limits for the ACLR measurement.

Limit Checking ← Limits ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR
Activate or deactivate limit checking for the ACLR measurement.

The following rules apply for the limits:

- A separate limit can be defined for each adjacent channel. The limit applies to both the upper and the lower adjacent channel.
- A relative and/or absolute limit can be defined. The check of both limit values can be activated independently.
- The R&S FSV checks adherence to the limits irrespective of whether the limits are absolute or relative or whether the measurement is carried out with absolute or rel-

ative levels. If both limits are active and if the higher of both limit values is exceeded, the measured value is marked by a preceding asterisk.

Remote command:
CALCulate<n>:LIMit<k>:ACPower[:STATe] on page 148
CALCulate<n>:LIMit<k>:ACPower:ACHannel:RESult on page 144
CALCulate<n>:LIMit<k>:ACPower:ALTernate<channel>[:RELative] on page 147

Relative Limit ← Limits ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR
Defines a limit relative to the carrier signal.

Remote command:
CALC:LIM:ACP ON, see CALCulate<n>:LIMit<k>:ACPower[:STATe] on page 148
CALC:LIM:ACP:<adjacent-channel> 0dBc,0dBc
CALC:LIM:ACP:<adjacent-channel>:STAT ON

Absolute Limit ← Limits ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR
Defines an absolute limit.

Remote command:
CALC:LIM:ACP ON, see CALCulate<n>:LIMit<k>:ACPower[:STATe] on page 148
CALC:LIM:ACP:<adjacent-channel>:ABS -10dBm,-10dBm
CALC:LIM:ACP:<adjacent-channel>:ABS:STAT ON, see CALCulate<n>:LIMit<k>:ACPower:ACHannel:ABSolute:STATe on page 143

Check ← Limits ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR
Activate or deactivate the limit to be considered during a limit check. The check of both limit values can be activated independently.

Chan Pwr/Hz ← CP/ACLR Settings ← Ch Power ACLR
If deactivated, the channel power is displayed in dBm. If activated, the channel power density is displayed instead. Thus, the absolute unit of the channel power is switched from dBm to dBm/Hz. The channel power density in dBm/Hz corresponds to the power inside a bandwidth of 1 Hz and is calculated as follows:

"channel power density = channel power – $\log_{10}$(channel bandwidth)"

By means of this function it is possible e.g. to measure the signal/noise power density or use the additional functions "ACLR (Abs/Rel)" on page 64 and "ACLR Reference" on page 60 to obtain the signal to noise ratio.

Remote command:
CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult:PHZ on page 133

Power Mode ← CP/ACLR Settings ← Ch Power ACLR
Opens a submenu to select the power mode.

Clear/Write ← Power Mode ← CP/ACLR Settings ← Ch Power ACLR
If this mode is activated, the channel power and the adjacent channel powers are calculated directly from the current trace (default mode).

Remote command:
`CALC:MARK:FUNC:POW:MODE WRIT`, see `CALCulate<n>:MARKer<m>:FUNCtion:POWer:MODE` on page 132

Max Hold ← Power Mode ← CP/ACLR Settings ← Ch Power ACLR
If this mode is activated, the power values are calculated from the current trace and compared with the previous power value using a maximum algorithm. The higher value is retained. If activated, the enhancement label "Pwr Max" is displayed.

Remote command:
`CALC:MARK:FUNC:POW:MODE MAXH`, see `CALCulate<n>:MARKer<m>:FUNCtion:POWer:MODE` on page 132

Select Trace ← CP/ACLR Settings ← Ch Power ACLR
Opens an edit dialog box to enter the trace number on which the CP/ACLR measurement is to be performed. Only activated traces can be selected.

For details on trace modes see chapter 3.3.2, "Trace Mode Overview", on page 105.

Remote command:
`[SENSe:]POWer:TRACe` on page 212

ACLR (Abs/Rel) ← CP/ACLR Settings ← Ch Power ACLR
Switches between absolute and relative power measurement in the adjacent channels.

Abs	The absolute power in the adjacent channels is displayed in the unit of the y-axis, e.g. in dBm, dBµV.
Rel	The level of the adjacent channels is displayed relative to the level of the transmission channel in dBc.

Remote command:
`[SENSe:]POWer:ACHannel:MODE` on page 206

Adjust Settings ← CP/ACLR Settings ← Ch Power ACLR
Automatically optimizes all instrument settings for the selected channel configuration (channel bandwidth, channel spacing) within a specific frequency range (channel bandwidth). The adjustment is carried out only once. If necessary, the instrument settings can be changed later.

For details on the settings of span, resolution bandwidth, video bandwidth, detector and trace averaging see chapter 3.3.11, "Optimized Settings for CP/ACLR Test Parameters", on page 122.

Remote command:
`[SENSe:]POWer:ACHannel:PRESet` on page 207

Sweep Time ← Ch Power ACLR
Opens an edit dialog box to enter the sweep time. With the RMS detector, a longer sweep time increases the stability of the measurement results.

The function of this softkey is identical to the Sweeptime Manual softkey in the "Bandwidth" menu.

Remote command:
[SENSe:]SWEep:TIME on page 217

Fast ACLR (On/Off) ← Ch Power ACLR
Switches between the IBW method ("Fast ACLR Off") and the zero span method ("Fast ACLR On").

When switched on, the R&S FSV sets the center frequency consecutively to the different channel center frequencies and measures the power with the selected measurement time (= sweep time/number of channels). The RBW filters suitable for the selected standard and frequency offset are automatically used (e.g. root raised cos with IS 136). For details on available channel filters see chapter 3.3.3, "Selecting the Appropriate Filter Type", on page 107.

The RMS detector is used for obtaining correct power measurement results. Therefore this requires no software correction factors.

Measured values are output as a list. The powers of the transmission channels are output in dBm, the powers of the adjacent channels in dBm.

The sweep time is selected depending on the desired reproducibility of results. Reproducibility increases with sweep time since power measurement is then performed over a longer time period. As a general approach, it can be assumed that approx. 500 non-correlated measured values are required for a reproducibility of 0.5 dB (99 % of the measurements are within 0.5 dB of the true measured value). This holds true for white noise. The measured values are considered as non-correlated if their time interval corresponds to the reciprocal of the measured bandwidth.

With IS 136 the measurement bandwidth is approx. 25 kHz, i.e. measured values at an interval of 40 µs are considered as non-correlated. A measurement time of 40 ms is thus required per channel for 1000 measured values. This is the default sweep time which the R&S FSV sets in coupled mode. Approx. 5000 measured values are required for a reproducibility of 0.1 dB (99 %), i.e. the measurement time is to be increased to 200 ms.

Remote command:
[SENSe:]POWer:HSPeed on page 211

Set CP Reference ← Ch Power ACLR
Defines the currently measured channel power as the reference value if channel power measurement is activated. The reference value is displayed in the "Tx1 (Ref) Power" field; the default value is 0 dBm.

The softkey is available only for multi carrier ACLR measurements.

In adjacent-channel power measurement with one or several carrier signals, the power is always referenced to a transmission channel, i.e. no value is displayed for "Tx1 (Ref) Power".

Remote command:
[SENSe:]POWer:ACHannel:REFerence:AUTO ONCE on page 208

Noise Correction ← Ch Power ACLR
If activated, the results are corrected by the instrument's inherent noise, which increases the dynamic range.

"ON" A reference measurement of the instrument's inherent noise is carried out. The noise power measured is then subtracted from the power in the channel that is being examined.
The inherent noise of the instrument depends on the selected center frequency, resolution bandwidth and level setting. Therefore, the correction function is disabled whenever one of these parameters is changed. A disable message is displayed on the screen. Noise correction must be switched on again manually after the change.

"OFF" No noise correction is performed.

"AUTO" Noise correction is performed. After a parameter change, noise correction is restarted automatically and a new correction measurement is performed.

Remote command:
`[SENSe:]POWer:NCORrection` on page 211

Adapt to Signal ← Ch Power ACLR
Opens a submenu to configure the measurEment with the following softkeys:

Auto Level & Time ← Adapt to Signal ← Ch Power ACLR
The Auto Level and Time softkey automatically adjusts the reference level and the trigger to frame time to their optimum levels. This prevents overloading of the R&S FSV.

Current measurements are aborted when pressing the softkey and resumed after the automatic level detection is finished.

Remote command:
`[SENSe:]POWer:ACHannel:AUTO:LTIMe` on page 183

Start Slot ← Adapt to Signal ← Ch Power ACLR
Sets the first slot of the measurement.

Remote command:
`[SENSe:]POWer:ACHannel:SLOT:STarT` on page 183

Stop Slot ← Adapt to Signal ← Ch Power ACLR
Sets the last slot of the measurement.

Remote command:
`[SENSe:]POWer:ACHannel:SLOT:STOP` on page 183

Spectrum Emission Mask
Performs a comparison of the signal power in different carrier offset ranges with the maximum values specified in the standard.

For details on screen layout and default values see the description of the Spectrum Emission Mask.

Also opens the Spectrum Emission Mask submenu containing the following softkeys:

Remote command:
CONFigure:CDPower[:BTS]:MEASurement on page 169
CALCulate<n>:MARKer:FUNCtion:CDPower[:BTS]:RESult? on page 130

Sweep List ← Spectrum Emission Mask
Opens a submenu to edit the sweep list and displays the "Sweep List" dialog box.

Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
After a preset, the sweep list contains a set of default ranges and parameters. For each range, you can change the parameters listed below. To insert or delete ranges, use the "Insert Before Range", "Insert After Range", "Delete Range" softkeys. The measurement results are not updated during editing but on closing the dialog box ("Edit Sweep List/ Close Sweep List" softkey, see "Close Sweep List" on page 70).

The changes of the sweep list are only kept until you load another parameter set (by pressing PRESET or by loading an XML file). If you want a parameter set to be available permanently, create an XML file for this configuration (for details refer to chapter 3.3.7, "Format Description of Spectrum Emission Mask XML Files", on page 111).

If you load one of the provided XML files ("Load Standard" softkey, see "Load Standard" on page 74), the sweep list contains ranges and parameters according to the selected standard. For further details refer also to chapter 3.3.8, "Provided XML Files for the Spectrum Emission Mask Measurement", on page 116.

Note: If you edit the sweep list, always follow the rules and consider the limitations described in chapter 3.3.5, "Ranges and Range Settings", on page 109.

Range Start / Range Stop ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets the start frequency/stop frequency of the selected range. Follow the rules described in chapter 3.3.5, "Ranges and Range Settings", on page 109.

In order to change the start/stop frequency of the first/last range, select the appropriate span with the SPAN key. If you set a span that is smaller than the overall span of the ranges, the measurement includes only the ranges that lie within the defined span and have a minimum span of 20 Hz. The first and last ranges are adapted to the given span as long as the minimum span of 20 Hz is not violated.

Frequency values for each range have to be defined relative to the center frequency. The reference range has to be centered on the center frequency. The minimum span of the reference range is given by the current TX Bandwidth.

Remote command:
[SENSe:]ESPectrum:RANGe<range>[:FREQuency]:STARt on page 190
[SENSe:]ESPectrum:RANGe<range>[:FREQuency]:STOP on page 191

Fast SEM ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Activates "Fast SEM" mode for all ranges in the sweep list. For details see chapter 3.3.9, "Fast Spectrum Emission Mask Measurements", on page 119.

Note: If "Fast SEM" mode is deactivated while Symmetric Setup mode is on, "Symmetrical Setup" mode is automatically also deactivated.

If "Fast SEM" mode is activated while "Symmetrical Setup" mode is on, not all range settings can be set automatically.

Remote command:
[SENSe:]ESPectrum:HighSPeed on page 187

Filter Type ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets the filter type for this range. For details on filters see also chapter 3.3.3, "Selecting the Appropriate Filter Type", on page 107.

Remote command:
[SENSe:]ESPectrum:RANGe<range>:FILTer:TYPE on page 190

RBW ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets the RBW value for this range.

Remote command:
[SENSe:]ESPectrum:RANGe<range>:BANDwidth[:RESolution] on page 189

VBW ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets the VBW value for this range.

Remote command:
[SENSe:]ESPectrum:RANGe<range>:BANDwidth:VIDeo on page 189

Sweep Time Mode ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Activates or deactivates the auto mode for the sweep time.

Remote command:
[SENSe:]ESPectrum:RANGe<range>:SWEep:TIME:AUTO on page 195

Sweep Time ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets the sweep time value for the range.

Remote command:
[SENSe:]ESPectrum:RANGe<range>:SWEep:TIME on page 195

Ref. Level ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets the reference level for the range.

Remote command:
[SENSe:]ESPectrum:RANGe<range>:RLEVel on page 195

RF Att. Mode ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Activates or deactivates the auto mode for RF attenuation.

Remote command:
[SENSe:]ESPectrum:RANGe<range>:INPut:ATTenuation:AUTO on page 192

RF Attenuator ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets the attenuation value for that range.

Remote command:
[SENSe:]ESPectrum:RANGe<range>:INPut:ATTenuation on page 191

Preamp ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Switches the preamplifier on or off.

Remote command:
[SENSe:]ESPectrum:RANGe<range>:INPut:GAIN:STATe on page 192

Transd. Factor ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets a transducer for the specified range. You can only choose a transducer that fulfills the following conditions:

- The transducer overlaps or equals the span of the range.
- The x-axis is linear.
- The unit is dB.

Remote command:
[SENSe:]ESPectrum:RANGe<range>:TRANsducer on page 196

Limit Check 1-4 ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets the type of limit check for all ranges.

For details on limit checks see the base unit description "Working with Lines in SEM".

The limit state affects the availability of all limit settings ("Abs Limit Start" on page 69, "Abs Limit Stop" on page 69, "Rel Limit Start" on page 69, "Rel Limit Stop" on page 70).

Depending on the number of active power classes (see "Power Class" dialog box), the number of limits that can be set varies. Up to four limits are possible. The sweep list is extended accordingly.

Remote command:
[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:STATe on page 194
CALCulate<n>:LIMit<k>:FAIL? on page 148

Abs Limit Start ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets an absolute limit value at the start frequency of the range [dBm].

This parameter is only available if the limit check is set accordingly (see "Limit Check 1-4" on page 69).

Remote command:
[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:ABSolute:STARt on page 193

Abs Limit Stop ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets an absolute limit value at the stop frequency of the range [dBm].

This parameter is only available if the limit check is set accordingly (see "Limit Check 1-4" on page 69).

Remote command:
[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:ABSolute:STOP on page 193

Rel Limit Start ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets a relative limit value at the start frequency of the range [dBc].

This parameter is only available if the limit check is set accordingly (see "Limit Check 1-4" on page 69).

Remote command:
[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:RELative:STARt
on page 193

Rel Limit Stop ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets a relative limit value at the stop frequency of the range [dBc].

This parameter is only available if the limit check is set accordingly (see "Sweep List dialog box" on page 67).

Remote command:
[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:RELative:STOP
on page 194

Close Sweep List ← Sweep List ← Spectrum Emission Mask
Closes the "Sweep List" dialog box and updates the measurement results.

Insert before Range ← Sweep List ← Spectrum Emission Mask
Inserts a new range to the left of the currently focused range. The range numbers of the currently focused range and all higher ranges are increased accordingly. The maximum number of ranges is 20.

For further details refer to chapter 3.3.5, "Ranges and Range Settings", on page 109.

Remote command:
ESP:RANG3:INS BEF, see [SENSe:]ESPectrum:RANGe<range>:INSert
on page 192

Insert after Range ← Sweep List ← Spectrum Emission Mask
Inserts a new range to the right of the currently focused range. The range numbers of all higher ranges are increased accordingly. The maximum number of ranges is 20.

For further details refer to chapter 3.3.5, "Ranges and Range Settings", on page 109.

Remote command:
ESP:RANG1:INS AFT, see [SENSe:]ESPectrum:RANGe<range>:INSert
on page 192

Delete Range ← Sweep List ← Spectrum Emission Mask
Deletes the currently focused range, if possible. The range numbers are updated accordingly. For further details refer to chapter 3.3.5, "Ranges and Range Settings", on page 109.

Remote command:
[SENSe:]ESPectrum:RANGe<range>:DELete on page 190

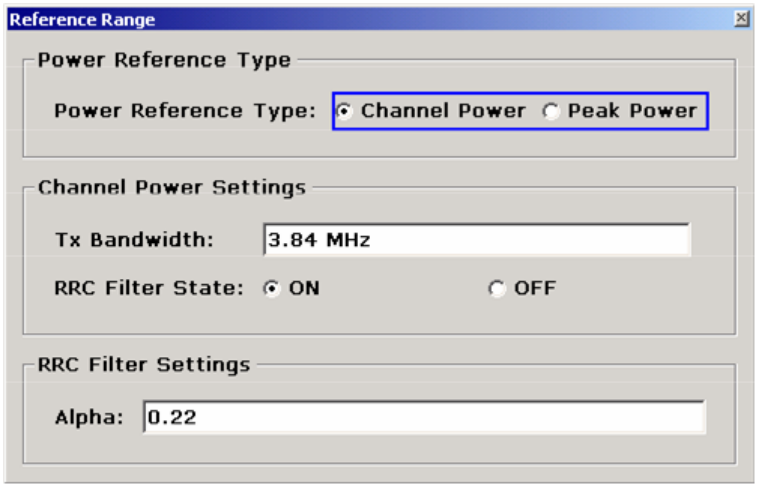
Symmetric Setup ← Sweep List ← Spectrum Emission Mask
If activated, the current sweep list configuration is changed to define a symmetrical setup regarding the reference range. The number of ranges to the left of the reference range is reflected to the right, i.e. any missing ranges on the right are inserted, while superfluous ranges are removed. The values in the ranges to the right of the reference range are adapted symmetrically to those in the left ranges.

Any changes to the range settings in active "Symmetric Setup" mode lead to symmetrical changes in the other ranges (where possible). In particular, this means:

- Inserting ranges: a symmetrical range is inserted on the other side of the reference range
- Deleting ranges: the symmetrical range on the other side of the reference range is also deleted
- Editing range settings: the settings in the symmetrical range are adapted accordingly

Note: If "Fast SEM" mode is deactivated while "Symmetric Setup" mode is on, "Sym Setup" mode is automatically also deactivated.
If "Fast SEM" mode is activated while "Symmetric Setup" mode is on, not all range settings can be set automatically.

Edit Reference Range ← Sweep List ← Spectrum Emission Mask
Opens the "Reference Range" dialog box to edit the additional settings used for SEM measurements.



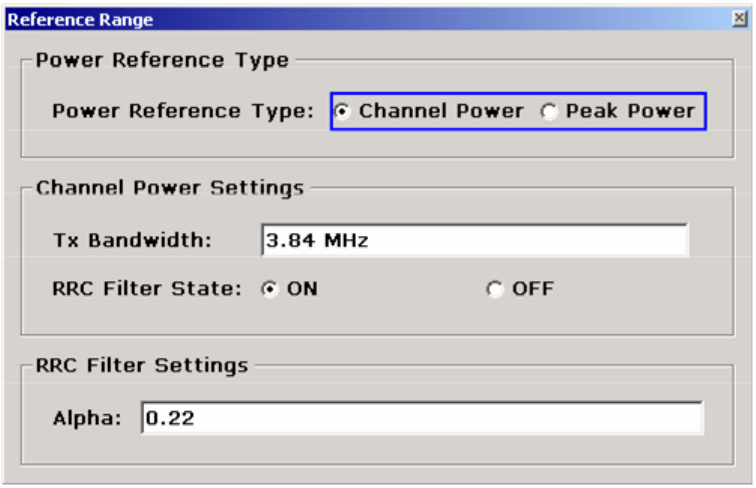
Two different power reference types are supported:

- "Peak Power"
  Measures the highest peak within the reference range.
- "Channel Power"
  Measures the channel power within the reference range (integral bandwidth method).
  If the "Channel Power" reference power type is activated, the dialog box is extended to define additional settings:
- "Tx Bandwidth"
  Defines the bandwidth used for measuring the channel power:
  minimum span ≤ value ≤ span of reference range
- "RRC Filter State"
  Activates or deactivates the use of an RRC filter.
- "RRC Filter Settings"
  Sets the alpha value of the RRC filter. This window is only available if the RRC filter is activated.

For further details refer to chapter 3.3.5, "Ranges and Range Settings", on page 109.

Remote command:
[SENSe:]ESPectrum:RTYPe on page 196
[SENSe:]ESPectrum:BWID on page 186
[SENSe:]ESPectrum:FILTer[:RRC][:STATe] on page 187
[SENSe:]ESPectrum:FILTer[:RRC]:ALPHa on page 187

Edit Reference Range ← Spectrum Emission Mask
Opens the "Reference Range" dialog box to edit the additional settings used for SEM measurements.



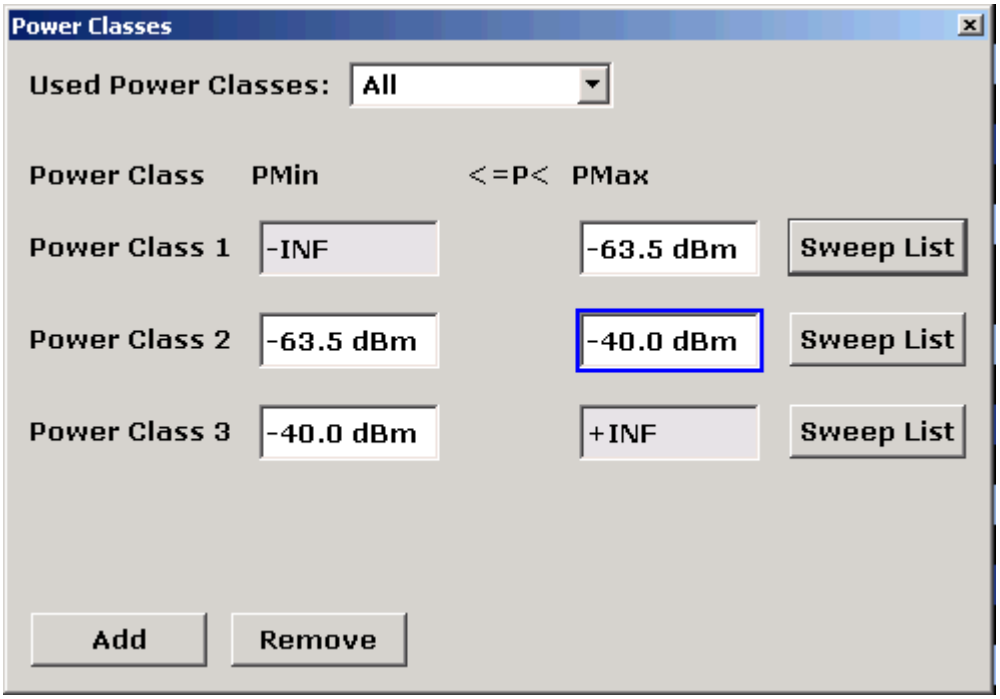
Two different power reference types are supported:

- "Peak Power"
  Measures the highest peak within the reference range.
- "Channel Power"
  Measures the channel power within the reference range (integral bandwidth method). If the "Channel Power" reference power type is activated, the dialog box is extended to define additional settings:
- "Tx Bandwidth"
  Defines the bandwidth used for measuring the channel power:
  minimum span ≤ value ≤ span of reference range
- "RRC Filter State"
  Activates or deactivates the use of an RRC filter.
- "RRC Filter Settings"
  Sets the alpha value of the RRC filter. This window is only available if the RRC filter is activated.

For further details refer to chapter 3.3.5, "Ranges and Range Settings", on page 109.

Remote command:
[SENSe:]ESPectrum:RTYPe on page 196
[SENSe:]ESPectrum:BWID on page 186
[SENSe:]ESPectrum:FILTer[:RRC][:STATe] on page 187
[SENSe:]ESPectrum:FILTer[:RRC]:ALPHa on page 187

Edit Power Classes ← Spectrum Emission Mask
Opens a dialog box to modify the power class settings.



Used Power Classes ← Edit Power Classes ← Spectrum Emission Mask
Choose the power classes to be used from this dropdown menu. It is only possible to select either one of the defined power classes or all of the defined power classes together.

Only power classes for which limits are defined are available for selection.

If "All" is selected, the power class that corresponds to the currently measured power in the reference range is used. The limits assigned to that power class are applied (see "PMin/PMax" on page 73).

Remote command:
`CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>[:EXCLusive]`
on page 150
To define all limits in one step:
`CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:LIMit[:STATe]`
on page 151

PMin/PMax ← Edit Power Classes ← Spectrum Emission Mask
Defines the level limits for each power class. The range always starts at -200 dBm (-INF) and always stops at 200 dBm (+INF). These fields cannot be modified. If more than one Power Class is defined, the value of "PMin" must be equal to the value of "PMax" of the last Power Class and vice versa.

Note that the power level may be equal to the lower limit, but must be lower than the upper limit:

$P_{min} \leqq P < P_{max}$

Remote command:
CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:MINimum on page 152
CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:MAXimum on page 152

Sweep List ← Edit Power Classes ← Spectrum Emission Mask
See "Sweep List" on page 67

Add/Remove ← Edit Power Classes ← Spectrum Emission Mask
Activates or deactivates power classes to be defined. Up to four power classes can be defined. The number of active power classes affects the availability of the items of the Used Power Classes dropdown menu.

Remote command:
CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>[:EXCLusive] on page 150

Load Standard ← Spectrum Emission Mask
Opens a dialog box to select an XML file which includes the desired standard specification. For details on the provided XML files refer to chapter 3.3.8, "Provided XML Files for the Spectrum Emission Mask Measurement", on page 116.

Remote command:
[SENSe:]ESPectrum:PRESet[:STANdard] on page 188

Save As Standard ← Spectrum Emission Mask
Opens the "Save As Standard" dialog box, in which the currently used SEM settings and parameters can be saved and exported into an *.xml file. Enter the name of the file in the "File name" field. For details on the structure and contents of the XML file refer to chapter 3.3.7, "Format Description of Spectrum Emission Mask XML Files", on page 111.

Remote command:
[SENSe:]ESPectrum:PRESet:STORe on page 189

Meas Start/Stop ← Spectrum Emission Mask
Aborts/restarts the current measurement and displays the status:

"Start" The measurement is currently running.

"Stop" The measurement has been stopped, or, in single sweep mode, the end of the sweep has been reached.

Remote command:
ABORt on page 234
INITiate<n>:ESPectrum on page 236

Restore Standard Files ← Spectrum Emission Mask
Copies the XML files from the `C:\R_S\instr\sem_backup` folder to the `C:\R_S\instr\sem_std` folder. Files of the same name are overwritten.

Remote command:
[SENSe:]ESPectrum:PRESet:RESTore on page 188

Adapt to Signal ← Spectrum Emission Mask
Opens a submenu to configure the measurEment with the following softkeys:

Auto Level & Time ← Adapt to Signal ← Spectrum Emission Mask
The Auto Level and Time softkey automatically adjusts the reference level and the trigger to frame time to their optimum levels. This prevents overloading of the R&S FSV.

Current measurements are aborted when pressing the softkey and resumed after the automatic level detection is finished.

Remote command:
`[SENSe:]POWer:ACHannel:AUTO:LTIMe` on page 183

Start Slot ← Adapt to Signal ← Spectrum Emission Mask
Sets the first slot of the measurement.

Remote command:
`[SENSe:]POWer:ACHannel:SLOT:STarT` on page 183

Stop Slot ← Adapt to Signal ← Spectrum Emission Mask
Sets the last slot of the measurement.

Remote command:
`[SENSe:]POWer:ACHannel:SLOT:STOP` on page 183

Occupied Bandwidth
Starts measurement of the bandwidth assigned to the signal.

For details on screen layout and default values see the description of the Occupied Bandwidth.

Also opens the Occupied Bandwidth submenu containing the following softkeys:

Remote command:
`CONFigure:CDPower[:BTS]:MEASurement` on page 169
`CALCulate<n>:MARKer:FUNCtion:CDPower[:BTS]:RESult?` on page 130

% Power Bandwidth (span > 0) ← Occupied Bandwidth
Opens an edit dialog box to enter the percentage of total power in the displayed frequency range which defines the occupied bandwidth. Values from 10% to 99.9% are allowed.

Remote command:
`[SENSe:]POWer:BANDwidth|BWIDth` on page 211

Channel Bandwidth (span > 0) ← Occupied Bandwidth
Opens an edit dialog box to enter the channel bandwidth for the transmission channel. The specified channel bandwidth is used for optimization of the test parameters (for details see chapter 3.3.11, "Optimized Settings for CP/ACLR Test Parameters", on page 122). The default setting is 14 kHz.

For measurements in line with a specific transmission standard, the bandwidth specified by the standard for the transmission channel must be entered.

Remote command:
`[SENSe:]POWer:ACHannel:BANDwidth|BWIDth[:CHANnel<channel>]`
on page 203

Adapt to Signal ← Occupied Bandwidth
Opens a submenu to configure the measurEment with the following softkeys:

Auto Level & Time ← Adapt to Signal ← Occupied Bandwidth
The Auto Level and Time softkey automatically adjusts the reference level and the trigger to frame time to their optimum levels. This prevents overloading of the R&S FSV.

Current measurements are aborted when pressing the softkey and resumed after the automatic level detection is finished.

Remote command:
`[SENSe:]POWer:ACHannel:AUTO:LTIMe` on page 183

Start Slot ← Adapt to Signal ← Occupied Bandwidth
Sets the first slot of the measurement.

Remote command:
`[SENSe:]POWer:ACHannel:SLOT:STarT` on page 183

Stop Slot ← Adapt to Signal ← Occupied Bandwidth
Sets the last slot of the measurement.

Remote command:
`[SENSe:]POWer:ACHannel:SLOT:STOP` on page 183

Adjust Settings ← Occupied Bandwidth
Automatically optimizes all instrument settings for the selected channel configuration (channel bandwidth, channel spacing) within a specific frequency range (channel bandwidth). The adjustment is carried out only once. If necessary, the instrument settings can be changed later.

For details on the settings of span, resolution bandwidth, video bandwidth, detector and trace averaging see chapter 3.3.11, "Optimized Settings for CP/ACLR Test Parameters", on page 122.

Remote command:
`[SENSe:]POWer:ACHannel:PRESet` on page 207

CCDF
Starts the measurement of the Complementary Cumulative Distribution Function and the Crest factor.

For details on screen layout and default values see the description of the Complementary Cumulative Distribution Function (CCDF).

Remote command:
`CONFigure:CDPower[:BTS]:MEASurement` on page 169

Percent Marker ← CCDF
Opens an edit dialog box to enter a probability value and to position marker 1. Thus, the power which is exceeded with a given probability can be determined very easily. If marker 1 is deactivated, it will be switched on automatically.

As all markers, the percent marker can be moved simply by touching it with a finger or mouse cursor and dragging it to the desired position.

Remote command:
CALCulate<n>:MARKer<m>:Y:PERCent on page 159

Res BW ← CCDF
Opens an edit dialog box to set the resolution bandwidth directly.

For correct measurement of the signal statistics the resolution bandwidth has to be wider than the signal bandwidth in order to measure the actual peaks of the signal amplitude correctly. In order not to influence the peak amplitudes the video bandwidth is automatically set to 10 MHz. The sample detector is used for detecting the video voltage.

Remote command:
[SENSe:]BANDwidth|BWIDth[:RESolution] on page 197

# of Samples ← CCDF
Opens an edit dialog box to set the number of power measurements that are taken into account for the statistics.

Apart from the number of measurements the overall measurement time depends also on the set resolution bandwidth as the resolution bandwidth directly influences the sampling rate.

Remote command:
CALCulate<n>:STATistics:NSAMples on page 161

Scaling ← CCDF
Opens a submenu to change the scaling parameters of x- and y-axis.

x-Axis Ref Level ← Scaling ← CCDF
Opens an edit dialog box to enter the reference level in the currently active unit (dBm, dBµV, etc). The function of this softkey is identical to the "Ref Level" softkey in the "Amplitude" menu (see "Ref Level" on page 19).

For the APD function this value is mapped to the right diagram border. For the CCDF function there is no direct representation of this value on the diagram as the x-axis is scaled relatively to the measured mean power.

Remote command:
CALCulate<n>:STATistics:SCALe:X:RLEVel on page 163

x-Axis Range ← Scaling ← CCDF
Opens the "Range" submenu to select a value for the level range to be covered by the statistics measurement selected.

Remote command:
CALCulate<n>:STATistics:SCALe:X:RANGe on page 163

Range Log 100 dB ← x-Axis Range ← Scaling ← CCDF
Sets the level display range to 100 dB.

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 176
Display range:
`DISP:WIND:TRAC:Y 100DB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 173

Range Log 50 dB ← x-Axis Range ← Scaling ← CCDF
Sets the level display range to 50 dB.

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 176
Display range:
`DISP:WIND:TRAC:Y 50DB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 173

Range Log 10 dB ← x-Axis Range ← Scaling ← CCDF
Sets the level display range to 10 dB.

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 176
Display range:
`DISP:WIND:TRAC:Y 10DB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 173

Range Log 5 dB ← x-Axis Range ← Scaling ← CCDF
Sets the level display range to 5 dB.

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 176
Display range:
`DISP:WIND:TRAC:Y 5DB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 173

Range Log 1 dB ← x-Axis Range ← Scaling ← CCDF
Sets the level display range to 1 dB.

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 176
Display range:
`DISP:WIND:TRAC:Y 1DB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 173

Range Log Manual ← x-Axis Range ← Scaling ← CCDF
Opens an edit dialog box to define the display range of a logarithmic level axis manually.

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 176
Display range:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 173

Range Linear % ← x-Axis Range ← Scaling ← CCDF
Selects linear scaling for the level axis in %.

The grid is divided into decadal sections.

Markers are displayed in the selected unit ("Unit" softkey). Delta markers are displayed in % referenced to the voltage value at the position of marker 1. This is the default setting for linear scaling.

Remote command:
`DISP:TRAC:Y:SPAC LIN`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 176

Range Lin. Unit ← x-Axis Range ← Scaling ← CCDF
Selects linear scaling in dB for the level display range, i.e. the horizontal lines are labeled in dB.

Markers are displayed in the selected unit ("Unit" softkey). Delta markers are displayed in dB referenced to the power value at the position of marker 1.

Remote command:
`DISP:TRAC:Y:SPAC LDB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 176

y-Axis Max Value ← Scaling ← CCDF
Opens an edit dialog box to define the upper limit of the displayed probability range. Values on the y-axis are normalized which means that the maximum value is 1.0. The y-axis scaling is defined via the y-Unit % / Abs softkey. The distance between max and min value must be at least one decade.

Remote command:
`CALCulate<n>:STATistics:SCALe:Y:UPPer` on page 164

y-Axis Min Value ← Scaling ← CCDF
Opens an edit dialog box to define the lower limit of the displayed probability range. Values in the range *1e-9 < value < 0.1* are allowed. The y-axis scaling is defined via the y-Unit % / Abs softkey. The distance between max and min value must be at least one decade.

Remote command:
`CALCulate<n>:STATistics:SCALe:Y:LOWer` on page 164

y-Unit % / Abs ← Scaling ← CCDF
Defines the scaling type of the y-axis. The default value is absolute scaling.

Remote command:
`CALCulate<n>:STATistics:SCALe:Y:UNIT` on page 164

Default Settings ← Scaling ← CCDF
Resets the x- and y-axis scalings to their preset values.

x-axis ref level:	-10 dBm
x-axis range APD:	100 dB
x-axis range CCDF:	20 dB
y-axis upper limit:	1.0
y-axis lower limit:	1E-6

Remote command:
`CALCulate<n>:STATistics:PRESet` on page 162

Adjust Settings ← Scaling ← CCDF
Adjusts the level settings according to the measured difference between peak and minimum power for APD measurement or peak and mean power for CCDF measurement in order to obtain maximum power resolution. Adjusts the reference level to the current input signal. For details see also the Adjust Ref Lvl softkey.

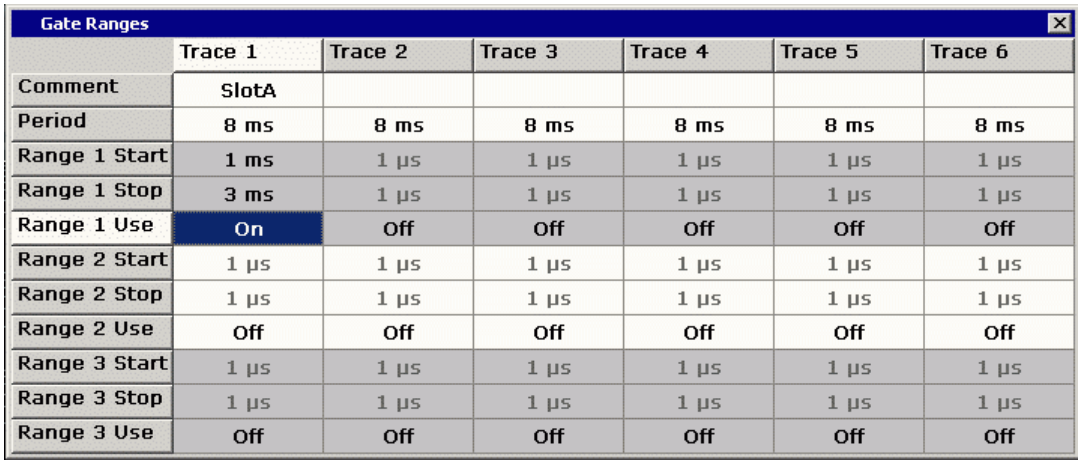
Remote command:
`CALCulate<n>:STATistics:SCALe:AUTO ONCE` on page 163

Gated Trigger (On/Off) ← CCDF
Activates and deactivates the gating for statistics functions for the ACP and the CCDF channel. The trigger source is changed to "EXTERN" if this function is switched on. The gate ranges are defined using the "Gate Ranges" on page 80 softkey.

Remote command:
`[SENSe:]SWEep:EGATe` on page 213
`[SENSe:]SWEep:EGATe:SOURce` on page 214

Gate Ranges ← CCDF
Opens a dialog to configure up to 3 gate ranges for each trace.

For details on configuration, see "Defining gated triggering for APD and CCDF measurements" in the base unit description.



Gate Ranges

	Trace 1	Trace 2	Trace 3	Trace 4	Trace 5	Trace 6
Comment	SlotA					
Period	8 ms	8 ms	8 ms	8 ms	8 ms	8 ms
Range 1 Start	1 ms	1 µs	1 µs	1 µs	1 µs	1 µs
Range 1 Stop	3 ms	1 µs	1 µs	1 µs	1 µs	1 µs
Range 1 Use	On	Off	Off	Off	Off	Off
Range 2 Start	1 µs	1 µs	1 µs	1 µs	1 µs	1 µs
Range 2 Stop	1 µs	1 µs	1 µs	1 µs	1 µs	1 µs
Range 2 Use	Off	Off	Off	Off	Off	Off
Range 3 Start	1 µs	1 µs	1 µs	1 µs	1 µs	1 µs
Range 3 Stop	1 µs	1 µs	1 µs	1 µs	1 µs	1 µs
Range 3 Use	Off	Off	Off	Off	Off	Off

Remote command:
`SWE:EGAT ON` (see `[SENSe:]SWEep:EGATe` on page 213)
Switches on the external gate mode.
`SWE:EGAT:TRAC1:COMM "SlotA"` (see `[SENSe:]SWEep:EGATe:TRACe<k>:COMMent` on page 214)
Adds a comment to trace 1.
`SWE:EGAT:TRAC1:STAT1 ON` (see `[SENSe:]SWEep:EGATe:TRACe<k>[:STATe<range>]` on page 215)
Activates tracing for range 1 of trace 1.
`SWE:EGAT:TRAC1:STAR1 3ms` (see `[SENSe:]SWEep:EGATe:TRACe<k>:STARt<range>` on page 215)
Sets the starting point for range 1 on trace 1 at 3 ms.
`SWE:EGAT:TRAC1:STop1 5ms` (see `[SENSe:]SWEep:EGATe:TRACe<k>:STOP<range>` on page 216)
Sets the stopping point for range 1 on trace 1 at 5 ms.
`SWE:EGAT:TRAC1:PER 5ms` (see `[SENSe:]SWEep:EGATe:TRACe<k>: PERiod` on page 214)
Defines the period for gated triggering to 5 ms.

Adapt to Signal ← CCDF
Opens a submenu to configure the measurEment with the following softkeys:

Auto Level & Time ← Adapt to Signal ← CCDF
The Auto Level and Time softkey automatically adjusts the reference level and the trigger to frame time to their optimum levels. This prevents overloading of the R&S FSV.

Current measurements are aborted when pressing the softkey and resumed after the automatic level detection is finished.

Remote command:
`[SENSe:]POWer:ACHannel:AUTO:LTIMe` on page 183

Start Slot ← Adapt to Signal ← CCDF
Sets the first slot of the measurement.

Remote command:
`[SENSe:]POWer:ACHannel:SLOT:STarT` on page 183

Stop Slot ← Adapt to Signal ← CCDF
Sets the last slot of the measurement.

Remote command:
[SENSe:]POWer:ACHannel:SLOT:STOP on page 183

Adjust Settings ← CCDF
Automatically optimizes all instrument settings for the selected channel configuration (channel bandwidth, channel spacing) within a specific frequency range (channel bandwidth). The adjustment is carried out only once. If necessary, the instrument settings can be changed later.

For details on the settings of span, resolution bandwidth, video bandwidth, detector and trace averaging see chapter 3.3.11, "Optimized Settings for CP/ACLR Test Parameters", on page 122.

Remote command:
[SENSe:]POWer:ACHannel:PRESet on page 207

Power vs Time
Starts the Power vs Time measurement. This measurement is required by the standard for the Emission Envelope Mask.

For details on screen layout and default values see the description of the Power vs Time.

Also opens the Power vs Time submenu containing the following softkeys:

Remote command:
CONFigure:CDPower[:BTS]:MEASurement on page 169

Switching Point ← Power vs Time
Opens a dialog box to enter the switching point.

The switching point is between 1 and 6 and defines the border of uplink slots and downlink slots.

Remote command:
CONFigure:CDPower[:BTS]:PVTime:SPOint on page 170

Start Meas ← Power vs Time
Starts the measurement and does a single sweep.

Remote command:
INIT:CONT OFF, see INITiate<n>:CONTinuous on page 235
INITiate<n>[:IMMediate] on page 236

No of Subframes ← Power vs Time
Defines the number of subframes that the R&S FSV includes in the measurement. The results of the Power vs Time measurement are based on the average of the number of the subframes.

Remote command:
CONFigure:CDPower[:BTS]:PVTime:SFRames on page 170

List Evaluation ← Power vs Time
Toggles the list evaluation on and off. The table shows the following data:

- **Start** and **Stop**
  Defines the start time and the stop time of one of the sections of the limit line in µs. Each row in the table represents one section of the limit line.
- **Avg**
  Shows the average power of the signal in the corresponding section of the limit line in relative and absolute values.
- **Max**
  Shows the maximum power of the signal in the coresponding section of the limit line in relative and absolute values.
- **Time @ MaxPower**
  Shows the exact moment in time at which the maximum power level occurs.

Auto Level & Time ← Power vs Time
Starts the autorange routine for the reference level. This also creates the relationship between trigger and subframe start.

Remote command:
`[SENSe:]POWer:ACHannel:AUTO:LTIMe` on page 183

3.2.7.2 Softkeys of the Frequency Menu

The following chapter describes all softkeys available in the "Frequency" menu. It is possible that your instrument configuration does not provide all softkeys. If a softkey is only available with a special option, model or (measurement) mode, this information is provided in the corresponding softkey description.

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CF Stepsize....84
└ 0.1*Span (span > 0)....84
└ 0.1*RBW (span > 0)....84
└ 0.5*Span (span > 0)....84
└ 0.5*RBW (span > 0)....85
└ x*Span (span > 0)....85
└ x*RBW (span > 0)....85
└ =Center....85
└ =Marker....85
└ Manual....85
Start....85
Stop....86
Frequency Offset....86

Center
Opens an edit dialog box to enter the center frequency. The allowed range of values for the center frequency depends on the frequency span.

span > 0: $span_{min}/2 \leq f_{center} \leq f_{max} - span_{min}/2$

span = 0: $0\ Hz \leq f_{center} \leq f_{max}$

f_{max} and $span_{min}$ are specified in the data sheet.

Remote command:
[SENSe:]FREQuency:CENTer on page 200

CF Stepsize
Opens a submenu to set the step size of the center frequency.

The step size defines the value by which the center frequency is increased or decreased when the arrow keys are pressed. When you use the rotary knob the center frequency changes in steps of 10% of the "Center Frequency Stepsize".

The step size can be set to a fraction of the span (span > 0) or a fraction of the resolution bandwidth (span = 0) or it can be set to a fixed value manually.

Apart from the =Center, =Marker and Manual softkeys, the other softkeys are displayed depending on the selected frequency span.

This softkey is available for RF measurements.

0.1*Span (span > 0) ← CF Stepsize
Sets the step size for the center frequency to 10 % of the span.

Remote command:
FREQ:CENT:STEP:LINK SPAN, see [SENSe:]FREQuency:CENTer:STEP:LINK on page 201
FREQ:CENT:STEP:LINK:FACT 10PCT, see [SENSe:]FREQuency:CENTer:STEP:LINK:FACTor on page 201

0.1*RBW (span > 0) ← CF Stepsize
Sets the step size for the center frequency to 10 % of the resolution bandwidth.

This is the default setting.

Remote command:
FREQ:CENT:STEP:LINK RBW, see [SENSe:]FREQuency:CENTer:STEP:LINK on page 201
FREQ:CENT:STEP:LINK:FACT 10PCT, see [SENSe:]FREQuency:CENTer:STEP:LINK:FACTor on page 201

0.5*Span (span > 0) ← CF Stepsize
Sets the step size for the center frequency to 50 % of the span.

Remote command:
FREQ:CENT:STEP:LINK SPAN, see [SENSe:]FREQuency:CENTer:STEP:LINK on page 201
FREQ:CENT:STEP:LINK:FACT 50PCT, see [SENSe:]FREQuency:CENTer:STEP:LINK:FACTor on page 201

0.5*RBW (span > 0) ← CF Stepsize
Sets the step size for the center frequency to 50 % of the resolution bandwidth.

Remote command:
`FREQ:CENT:STEP:LINK RBW`, see `[SENSe:]FREQuency:CENTer:STEP:LINK` on page 201
`FREQ:CENT:STEP:LINK:FACT 50PCT`, see `[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor` on page 201

x*Span (span > 0) ← CF Stepsize
Opens an edit dialog box to set the step size for the center frequency as a percentage (%) of the span.

Remote command:
`FREQ:CENT:STEP:LINK SPAN`, see `[SENSe:]FREQuency:CENTer:STEP:LINK` on page 201
`FREQ:CENT:STEP:LINK:FACT 20PCT`, see `[SENSe:]FREQuency:CENTer:STEP:LINK` on page 201

x*RBW (span > 0) ← CF Stepsize
Opens an edit dialog box to set the step size for the center frequency as a percentage (%) of the resolution bandwidth. Values between 1 % and 100 % in steps of 1 % are allowed. The default setting is 10 %.

Remote command:
`FREQ:CENT:STEP:LINK RBW`, see `[SENSe:]FREQuency:CENTer:STEP:LINK` on page 201
`FREQ:CENT:STEP:LINK:FACT 20PCT`, see `[SENSe:]FREQuency:CENTer:STEP:LINK` on page 201

=Center ← CF Stepsize
Sets the step size to the value of the center frequency and removes the coupling of the step size to span or resolution bandwidth.

This function is especially useful for measurements of the signal harmonics. In this case, each stroke of the arrow key selects the center frequency of another harmonic.

=Marker ← CF Stepsize
Sets the step size to the value of the current marker and removes the coupling of the step size to span or resolution bandwidth.

This function is especially useful for measurements of the signal harmonics. In this case, each stroke of the arrow key selects the center frequency of another harmonic.

Manual ← CF Stepsize
Opens an edit dialog box to enter a fixed step size for the center frequency.

Remote command:
`[SENSe:]FREQuency:CENTer:STEP` on page 200

Start
Opens an edit dialog box to define the start frequency. The following range of values is allowed:

$f_{min} \leq f_{start} \leq f_{max} - span_{min}$

f_{min}, f_{max} and $span_{min}$ are specified in the data sheet.

This softkey is available for RF measurements.

Remote command:
`[SENSe:]FREQuency:STARt` on page 202

Stop
Opens an edit dialog box to define the stop frequency. The following range of values for the stop frequency is allowed:

$f_{min} + span_{min} \leq f_{stop} \leq f_{max}$

f_{min} , f_{max} and $span_{min}$ are specified in the data sheet.

This softkey is available for RF measurements.

Remote command:
`[SENSe:]FREQuency:STOP` on page 202

Frequency Offset
Opens an edit dialog box to enter a frequency offset that shifts the displayed frequency range by the specified offset.

The softkey indicates the current frequency offset. The allowed values range from -100 GHz to 100 GHz. The default setting is 0 Hz.

Remote command:
`[SENSe:]FREQuency:OFFSet` on page 202

3.2.7.3 Softkeys of the Span Menu for RF Measurements

The following chapter describes all softkeys available in the "Span" menu for RF measurements, except for "Power" and "Power vs Time" measurements.

Span Manual....86
Sweeptime Manual....87
Full Span....87
Last Span....87

Span Manual
Opens an edit dialog box to enter the frequency span. The center frequency remains the same when you change the span.

The following range is allowed:

span = 0: 0 Hz

span >0: $span_{min} \leq f_{span} \leq f_{max}$

f_{max} and $span_{min}$ are specified in the data sheet.

Remote command:
`[SENSe:]FREQuency:SPAN` on page 202

Sweeptime Manual
Opens an edit dialog box to enter the sweep time.

Sweep time	
absolute max. sweep time value:	16000 s
absolute min. sweep time value:	zero span: 1 µs
	span > 0: depends on device model (refer to data sheet)

Allowed values depend on the ratio of span to RBW and RBW to VBW. For details refer to the data sheet.

Numeric input is always rounded to the nearest possible sweep time. For rotary knob or UPARROW/DNARROW key inputs, the sweep time is adjusted in steps either downwards or upwards.

The manual input mode of the sweep time is indicated by a green bullet next to the "SWT" display in the channel bar. If the selected sweep time is too short for the selected bandwidth and span, level measurement errors will occur due to a too short settling time for the resolution or video filters. In this case, the R&S FSV displays the error message "UNCAL" and marks the indicated sweep time with a red bullet.

This softkey is available for RF measurements, but not for CCDF or Power vs Time measurements.

Remote command:
`SWE:TIME:AUTO OFF`, see `[SENSe:]SWEep:TIME:AUTO` on page 217
`[SENSe:]SWEep:TIME` on page 217

Full Span
Sets the span to the full frequency range of the R&S FSV specified in the data sheet. This setting is useful for overview measurements.

Remote command:
`[SENSe:]FREQuency:SPAN:FULL` on page 202

Last Span
Sets the span to the previous value. With this function e.g. a fast change between overview measurement and detailed measurement is possible.

3.2.7.4 Softkeys of the Amplitude Menu for RF Measurements

The following table shows all softkeys available in the "Amplitude" menu of the TD-SCDMA BTS and UE measurement application for RF measurements except for Power vs Time measurements. The softkeys in the "Amplitude" menu for CDA and Power vs Time measurements are described in chapter 3.1.1.3, "Softkeys of the Amplitude Menu", on page 39.

Ref Level....88
Range....88
└ Range Log 100 dB....88
└ Range Log 50 dB....88
└ Range Log 10 dB....89

└ Range Log 5 dB....89
└ Range Log 1 dB....89
└ Range Log Manual....89
└ Range Linear %....89
└ Range Lin. Unit....90
Preamp On/Off....90
RF Atten Manual/Mech Att Manual....90
RF Atten Auto/Mech Att Auto....91
El Atten On/Off....91
El Atten Mode (Auto/Man)....91
Ref Level Offset....92
Ref Level Position....92
Grid Abs/Rel....92
Input (AC/DC)....92

Ref Level
Opens an edit dialog box to enter the reference level in the current unit (dBm, dBµV, etc).

The reference level is the maximum value the AD converter can handle without distortion of the measured value. Signal levels above this value will not be measured correctly, which is indicated by the "IFOVL" status display.

Remote command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel` on page 175

Range
Opens a submenu to define the display range of the level axis.

This softkey and its submenu are available for RF measurements except for Power vs Time measurements.

Range Log 100 dB ← Range
Sets the level display range to 100 dB.

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 176
Display range:
`DISP:WIND:TRAC:Y 100DB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 173

Range Log 50 dB ← Range
Sets the level display range to 50 dB.

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 176
Display range:
`DISP:WIND:TRAC:Y 50DB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 173

Range Log 10 dB ← Range
Sets the level display range to 10 dB.

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 176
Display range:
`DISP:WIND:TRAC:Y 10DB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 173

Range Log 5 dB ← Range
Sets the level display range to 5 dB.

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 176
Display range:
`DISP:WIND:TRAC:Y 5DB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 173

Range Log 1 dB ← Range
Sets the level display range to 1 dB.

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 176
Display range:
`DISP:WIND:TRAC:Y 1DB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 173

Range Log Manual ← Range
Opens an edit dialog box to define the display range of a logarithmic level axis manually.

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 176
Display range:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 173

Range Linear % ← Range
Selects linear scaling for the level axis in %.

The grid is divided into decadal sections.

Markers are displayed in the selected unit ("Unit" softkey). Delta markers are displayed in % referenced to the voltage value at the position of marker 1. This is the default setting for linear scaling.

Remote command:
`DISP:TRAC:Y:SPAC LIN`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 176

Range Lin. Unit ← Range
Selects linear scaling in dB for the level display range, i.e. the horizontal lines are labeled in dB.

Markers are displayed in the selected unit ("Unit" softkey). Delta markers are displayed in dB referenced to the power value at the position of marker 1.

Remote command:
`DISP:TRAC:Y:SPAC LDB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 176

Preamp On/Off
Switches the preamplifier on and off.

If option R&S FSV-B22 is installed, the preamplifier is only active below 7 GHz.

If option R&S FSV-B24 is installed, the preamplifier is active for all frequencies.

This function is not available for input from the R&S Digital I/Q Interface (option R&S FSV-B17).

Remote command:
`INPut:GAIN:STATe` on page 230

RF Atten Manual/Mech Att Manual
Opens an edit dialog box to enter the attenuation, irrespective of the reference level. If electronic attenuation is activated (option R&S FSV-B25 only; "El Atten Mode Auto" softkey), this setting defines the mechanical attenuation.

The mechanical attenuation can be set in 10 dB steps.

The RF attenuation can be set in 5 dB steps (with option R&S FSV-B25: 1 dB steps). The range is specified in the data sheet. If the current reference level cannot be set for the set RF attenuation, the reference level is adjusted accordingly.

This function is not available for input from the R&S Digital I/Q Interface (option R&S FSV-B17).

The RF attenuation defines the level at the input mixer according to the formula:

$level_{mixer} = level_{input} - RF\ attenuation$

Note: As of firmware version 1.61, the maximum mixer level allowed is **0 dBm**. Mixer levels above this value may lead to incorrect measurement results, which are indicated by the "OVLD" status display. The increased mixer level allows for an improved signal, but also increases the risk of overloading the instrument!

Remote command:
`INPut:ATTenuation` on page 225

RF Atten Auto/Mech Att Auto
Sets the RF attenuation automatically as a function of the selected reference level. This ensures that the optimum RF attenuation is always used. It is the default setting.

This function is not available for input from the R&S Digital I/Q Interface (option R&S FSV-B17).

Remote command:
`INPut:ATTenuation:AUTO` on page 225

El Atten On/Off
This softkey switches the electronic attenuator on or off. This softkey is only available with option R&S FSV-B25.

When the electronic attenuator is activated, the mechanical and electronic attenuation can be defined separately. Note however, that both parts must be defined in the same mode, i.e. either both manually, or both automatically.

This function is not available for input from the R&S Digital I/Q Interface (option R&S FSV-B17).

- To define the mechanical attenuation, use the RF Atten Manual/Mech Att Manual or RF Atten Auto/Mech Att Auto softkeys.
- To define the electronic attenuation, use the El Atten Mode (Auto/Man) softkey.

Note: This function is not available for stop frequencies (or center frequencies in zero span) >7 GHz. In this case, the electronic and mechanical attenuation are summarized and the electronic attenuation can no longer be defined individually. As soon as the stop or center frequency is reduced below 7 GHz, this function is available again.
When the electronic attenuator is switched off, the corresponding RF attenuation mode (auto/manual) is automatically activated.

Remote command:
`INPut:EATT:AUTO` on page 230

El Atten Mode (Auto/Man)
This softkey defines whether the electronic attenuator value is to be set automatically or manually. If manual mode is selected, an edit dialog box is opened to enter the value. This softkey is only available with option R&S FSV-B25, and only if the electronic attenuator has been activated via the El Atten On/Off softkey.

Note: This function is not available for stop frequencies (or center frequencies in zero span) >7 GHz. In this case, the electronic and mechanical attenuation are summarized and the electronic attenuation can no longer be defined individually. As soon as the stop or center frequency is reduced below 7 GHz, electronic attenuation is available again. If the electronic attenuation was defined manually, it must be re-defined.

The attenuation can be varied in 1 dB steps from 0 to 30 dB. Other entries are rounded to the next lower integer value.

To re-open the edit dialog box for manual value definition, select the "Man" mode again.

If the defined reference level cannot be set for the given RF attenuation, the reference level is adjusted accordingly and the warning "Limit reached" is output.

Remote command:
`INPut:EATT:AUTO` on page 230
`INPut:EATT` on page 229

Ref Level Offset
Opens an edit dialog box to enter the arithmetic level offset. This offset is added to the measured level irrespective of the selected unit. The scaling of the y-axis is changed accordingly. The setting range is ±200 dB in 0.1 dB steps.

Remote command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet` on page 175

Ref Level Position
Opens an edit dialog box to enter the reference level position, i.e. the position of the maximum AD converter value on the level axis. The setting range is from -200 to +200 %, 0 % corresponding to the lower and 100 % to the upper limit of the diagram.

Only available for RF measurements except for Power vs Time measurements.

Remote command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RPOSition` on page 175

Grid Abs/Rel
Switches between absolute and relative scaling of the level axis (not available with "Linear" range).

Only available for RF measurements except for Power vs Time measurements.

"Abs" Absolute scaling: The labeling of the level lines refers to the absolute value of the reference level. Absolute scaling is the default setting.

"Rel" Relative scaling: The upper line of the grid is always at 0 dB. The scaling is in dB whereas the reference level is always in the set unit (for details on unit settings see the "Unit" softkey).

Remote command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:MODE` on page 174

Input (AC/DC)
Toggles the RF input of the R&S FSV between AC and DC coupling.

This function is not available for input from the R&S Digital I/Q Interface (option R&S FSV-B17).

Remote command:
`INPut:COUPling` on page 226

3.2.7.5 Softkeys of the Bandwidth Menu

The following table shows all softkeys available in the "Bandwidth" menu. It is possible that your instrument configuration does not provide all softkeys. If a softkey is only available with a special option, model or (measurement) mode, this information is provided in the corresponding softkey description.

For Spurious Emission Measurements, the settings are defined in the "Sweep List" dialog, see the description in the base unit.

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Res BW Auto....93
Video BW Manual....94
Video BW Auto....94
Sweeptime Manual....94
Sweeptime Auto....95
Sweep Type....95
└ Sweep....96
└ FFT....96
└ Auto....96
└ FFT Filter Mode....96
└ Auto....96
└ Narrow....96
Coupling Ratio....96
└ RBW/VBW Sine [1/1]....97
└ RBW/VBW Pulse [.1]....97
└ RBW/VBW Noise [10]....97
└ RBW/VBW Manual....97
└ Span/RBW Auto [100]....98
└ Span/RBW Manual....98
└ Default Coupling....98
Filter Type....98

Res BW Manual
Opens an edit dialog box to enter a value for the resolution bandwidth. The available resolution bandwidths are specified in the data sheet.

For details on the correlation between resolution bandwidth and filter type refer to chapter 3.3.3, "Selecting the Appropriate Filter Type", on page 107.

Numeric input is always rounded to the nearest possible bandwidth. For rotary knob or UP/DNARROW key inputs, the bandwidth is adjusted in steps either upwards or downwards.

The manual input mode of the resolution bandwidth is indicated by a green bullet next to the "RBW" display in the channel bar.

This softkey is available for measuring the Adjacent Channel Power, the Spectrum Emission Mask, the Occupied Bandwidth and the CCDF. It is also available for Power vs Time measurements.

Remote command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO` on page 197
`[SENSe:]BANDwidth|BWIDth[:RESolution]` on page 197

Res BW Auto
Couples the resolution bandwidth to the selected span (for span > 0). If you change the span, the resolution bandwidth is automatically adjusted.

This setting is recommended if you need the ideal resolution bandwidth in relation to a particular span.

This softkey is available for measuring the Adjacent Channel Power, the Occupied Bandwidth and the CCDF. It is also available for Power vs Time measurements.

Remote command:
[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO on page 197

Video BW Manual
Opens an edit dialog box to enter the video bandwidth. The available video bandwidths are specified in the data sheet.

Numeric input is always rounded to the nearest possible bandwidth. For rotary knob or UP/DOWN key inputs, the bandwidth is adjusted in steps either upwards or downwards.

The manual input mode of the video bandwidth is indicated by a green bullet next to the "VBW" display in the channel bar.

Note: RMS detector and VBW.
If an RMS detector is used, the video bandwidth in the hardware is bypassed. Thus, duplicate trace averaging with small VBWs and RMS detector no longer occurs. However, the VBW is still considered when calculating the sweep time. This leads to a longer sweep time for small VBW values. Thus, you can reduce the VBW value to achieve more stable trace curves even when using an RMS detector. Normally, if the RMS detector is used the sweep time should be increased to get more stable trace curves. For details on detectors see chapter 3.3.1, "Detector Overview", on page 104.

This softkey is available for measuring the Adjacent Channel Power, the Spectrum Emission Mask and the Occupied Bandwidth. It is also available for Power vs Time measurements.

Remote command:
[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO on page 199
[SENSe:]BANDwidth|BWIDth:VIDeo on page 199

Video BW Auto
Couples the video bandwidth to the resolution bandwidth. If you change the resolution bandwidth, the video bandwidth is automatically adjusted.

This setting is recommended if a minimum sweep time is required for a selected resolution bandwidth. Narrow video bandwidths result in longer sweep times due to the longer settling time. Wide bandwidths reduce the signal/noise ratio.

This softkey is available for measuring the Adjacent Channel Power, the Spectrum Emission Mask and the Occupied Bandwidth. It is also available for Power vs Time measurements.

Remote command:
[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO on page 199

Sweeptime Manual
Opens an edit dialog box to enter the sweep time.

Sweep time	
absolute max. sweep time value:	16000 s
absolute min. sweep time value:	zero span: 1 µs
	span > 0: depends on device model (refer to data sheet)

Allowed values depend on the ratio of span to RBW and RBW to VBW. For details refer to the data sheet.

Numeric input is always rounded to the nearest possible sweep time. For rotary knob or UPARROW/DNARROW key inputs, the sweep time is adjusted in steps either downwards or upwards.

The manual input mode of the sweep time is indicated by a green bullet next to the "SWT" display in the channel bar. If the selected sweep time is too short for the selected bandwidth and span, level measurement errors will occur due to a too short settling time for the resolution or video filters. In this case, the R&S FSV displays the error message "UNCAL" and marks the indicated sweep time with a red bullet.

This softkey is available for RF measurements, but not for CCDF or Power vs Time measurements.

Remote command:
`SWE:TIME:AUTO OFF`, see `[SENSe:]SWEep:TIME:AUTO` on page 217
`[SENSe:]SWEep:TIME` on page 217

Sweeptime Auto
Couples the sweep time to the span, video bandwidth (VBW) and resolution bandwidth (RBW) (not available for zero span). If you change the span, resolution bandwidth or video bandwidth, the sweep time is automatically adjusted.

The R&S FSV always selects the shortest sweep time that is possible without falsifying the signal. The maximum level error is < 0.1 dB, compared to using a longer sweep time.

This softkey is available for measuring the Adjacent Channel Power, the Spectrum Emission Mask and the Occupied Bandwidth.

Remote command:
`[SENSe:]SWEep:TIME:AUTO` on page 217

Sweep Type
Opens a submenu to define the sweep type.

This softkey is available for measuring the Signal Power, the Adjacent Channel Power and the Occupied Bandwidth.

This function is not available in IQ Analyzer mode or for input from the R&S Digital I/Q Interface (option R&S FSV-B17).

In frequency sweep mode, the analyzer provides several possible methods of sweeping:

- "Sweep" on page 96
- "FFT" on page 96 (not available with 5-Pole filters, channel filters or RRC filters, see chapter 3.3.3, "Selecting the Appropriate Filter Type", on page 107)
- "Auto" on page 96

Sweep ← Sweep Type
Sets the Sweep Type to standard analog frequency sweep.

In the standard sweep mode, the local oscillator is set to provide the spectrum quasi analog from the start to the stop frequency.

Remote command:
`SWE:TYPE SWE`, see `[SENSe:]SWEep:TYPE` on page 217

FFT ← Sweep Type
Sets the Sweep Type to FFT mode.

The FFT sweep mode samples on a defined frequency value and transforms it to the spectrum by fast Fourier transformation (FFT).

FFT is not available when using 5-Pole filters, Channel filters or RRC filters. In this case, sweep mode is used.

Note: The same applies when a tracking generator (internal or external, options R&S FSV-B9/B10) is active.

Remote command:
`SWE:TYPE FFT`, see `[SENSe:]SWEep:TYPE` on page 217

Auto ← Sweep Type
Automatically sets the fastest available Sweep Type for the current measurement. Auto mode is set by default.

Remote command:
`SWE:TYPE AUTO`, see `[SENSe:]SWEep:TYPE` on page 217

FFT Filter Mode ← Sweep Type
Defines the filter mode to be used for FFT filters by defining the partial span size. The partial span is the span which is covered by one FFT analysis.

Auto ← FFT Filter Mode ← Sweep Type
The firmware determines whether to use wide or narrow filters to obtain the best measurement results.

Remote command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT` on page 197

Narrow ← FFT Filter Mode ← Sweep Type
For an RBW ≤ 10kHz, the FFT filters with the smaller partial span are used. This allows you to perform measurements near a carrier with a reduced reference level due to a narrower analog prefilter.

Remote command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT` on page 197

Coupling Ratio
Opens a submenu to select the coupling ratios for functions coupled to the bandwidth.

This softkey and its submenu is available for measuring the Adjacent Channel Power, the Spectrum Emission Mask, the Occupied Bandwidth and the CCDF.

RBW/VBW Sine [1/1] ← Coupling Ratio
Sets the following coupling ratio:

"video bandwidth = resolution bandwidth"

This is the default setting for the coupling ratio resolution bandwidth/video bandwidth.

This is the coupling ratio recommended if sinusoidal signals are to be measured.

This setting takes effect if you define the video bandwidth automatically (Video BW Auto).

Remote command:
`BAND:VID:RAT 1`, see `[SENSe:]BANDwidth|BWIDth:VIDeo:RATio` on page 199

RBW/VBW Pulse [.1] ← Coupling Ratio
Sets the following coupling ratio:

"video bandwidth = 10 × resolution bandwidth or"

"video bandwidth = 10 MHz (= max. VBW)."

This coupling ratio is recommended whenever the amplitudes of pulsed signals are to be measured correctly. The IF filter is exclusively responsible for pulse shaping. No additional evaluation is performed by the video filter.

This setting takes effect if you define the video bandwidth automatically (Video BW Auto).

Remote command:
`BAND:VID:RAT 10`, see `[SENSe:]BANDwidth|BWIDth:VIDeo:RATio` on page 199

RBW/VBW Noise [10] ← Coupling Ratio
Sets the following coupling ratio:

"video bandwidth = resolution bandwidth/10"

At this coupling ratio, noise and pulsed signals are suppressed in the video domain. For noise signals, the average value is displayed.

This setting takes effect if you define the video bandwidth automatically (Video BW Auto).

Remote command:
`BAND:VID:RAT 0.1`, see `[SENSe:]BANDwidth|BWIDth:VIDeo:RATio` on page 199

RBW/VBW Manual ← Coupling Ratio
Activates the manual input of the coupling ratio.

The resolution bandwidth/video bandwidth ratio can be set in the range 0.001 to 1000.

This setting takes effect if you define the video bandwidth automatically (Video BW Auto).

Remote command:
`BAND:VID:RAT 10`, see `[SENSe:]BANDwidth|BWIDth:VIDeo:RATio` on page 199

Span/RBW Auto [100] ← Coupling Ratio
Sets the following coupling ratio:

"resolution bandwidth = span/100"

This coupling ratio is the default setting of the R&S FSV.

This setting takes effect if you define the resolution bandwidth automatically (Res BW Auto).

Remote command:
`BAND:VID:RAT 0.001`, see `[SENSe:]BANDwidth|BWIDth:VIDeo:RATio` on page 199

Span/RBW Manual ← Coupling Ratio
Activates the manual input of the coupling ratio.

This setting takes effect if you define the resolution bandwidth automatically (Res BW Auto).

The span/resolution bandwidth ratio can be set in the range 1 to 10000.

Remote command:
`BAND:RAT 0.1`, see `[SENSe:]BANDwidth|BWIDth[:RESolution]:RATio` on page 198

Default Coupling ← Coupling Ratio
Sets all coupled functions to the default state ("AUTO").

In addition, the ratio "RBW/VBW" is set to "SINE [1/1]" and the ratio "SPAN/RBW" to *100.*

This softkey is available for Power vs Time measurements.

Remote command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO` on page 197
`[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO` on page 199
`[SENSe:]SWEep:TIME:AUTO` on page 217

Filter Type
Opens a submenu to select the filter type.

This softkey and its submenu are available for measuring the Adjacent Channel Power, the Spectrum Emission Mask, the Occupied Bandwidth and the CCDF. Instead of opening a submenu, this softkey opens the "Sweep List" dialog box to select the filter type when measuring the Spectrum Emission Mask.

The submenu contains the following softkeys:

- Normal (3 dB)
- CISPR (6 dB)
- MIL Std (6 dB)
  Note that the 6 dB bandwidths are available only with option R&S FSV-K54.
- Channel
- RRC
- 5-Pole (not available for sweep type "FFT")

For detailed information on filters see chapter 3.3.3, "Selecting the Appropriate Filter Type", on page 107 and chapter 3.3.4, "List of Available RRC and Channel Filters", on page 107.

Remote command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:TYPE` on page 198

3.2.7.6 Softkeys of the Sweep Menu

The following table shows all softkeys available in the "Sweep" menu. It is possible that your instrument configuration does not provide all softkeys. If a softkey is only available with a special option, model or (measurement) mode, this information is provided in the corresponding softkey description.

Continuous Sweep....99
Single Sweep....99
Continue Single Sweep....99
Sweeptime Manual....100
Sweeptime Auto....100
Sweep Type....100
- Sweep....101
- FFT....101
- Auto....101
- FFT Filter Mode....101
  - Auto....101
  - Narrow....102

Sweep Count....102
Sweep Points....102

Continuous Sweep
Sets the continuous sweep mode: the sweep takes place continuously according to the trigger settings. This is the default setting.

The trace averaging is determined by the sweep count value (see the "Sweep Count" softkey, "Sweep Count" on page 44).

Remote command:
`INIT:CONT ON`, see `INITiate<n>:CONTinuous` on page 235

Single Sweep
Sets the single sweep mode: after triggering, starts the number of sweeps that are defined by using the Sweep Count softkey. The measurement stops after the defined number of sweeps has been performed.

Remote command:
`INIT:CONT OFF`, see `INITiate<n>:CONTinuous` on page 235

Continue Single Sweep
Repeats the number of sweeps set by using the Sweep Count softkey, without deleting the trace of the last measurement.

This is particularly of interest when using the trace configurations "Average" or "Max Hold" to take previously recorded measurements into account for averaging/maximum search.

Remote command:
INITiate<n>:CONMeas on page 235

Sweeptime Manual
Opens an edit dialog box to enter the sweep time.

Sweep time	
absolute max. sweep time value:	16000 s
absolute min. sweep time value:	zero span: 1 µs
	span > 0: depends on device model (refer to data sheet)

Allowed values depend on the ratio of span to RBW and RBW to VBW. For details refer to the data sheet.

Numeric input is always rounded to the nearest possible sweep time. For rotary knob or UPARROW/DNARROW key inputs, the sweep time is adjusted in steps either downwards or upwards.

The manual input mode of the sweep time is indicated by a green bullet next to the "SWT" display in the channel bar. If the selected sweep time is too short for the selected bandwidth and span, level measurement errors will occur due to a too short settling time for the resolution or video filters. In this case, the R&S FSV displays the error message "UNCAL" and marks the indicated sweep time with a red bullet.

This softkey is available for RF measurements, but not for CCDF or Power vs Time measurements.

Remote command:
SWE:TIME:AUTO OFF, see [SENSe:]SWEep:TIME:AUTO on page 217
[SENSe:]SWEep:TIME on page 217

Sweeptime Auto
Couples the sweep time to the span, video bandwidth (VBW) and resolution bandwidth (RBW) (not available for zero span). If you change the span, resolution bandwidth or video bandwidth, the sweep time is automatically adjusted.

The R&S FSV always selects the shortest sweep time that is possible without falsifying the signal. The maximum level error is < 0.1 dB, compared to using a longer sweep time.

This softkey is available for measuring the Adjacent Channel Power, the Spectrum Emission Mask and the Occupied Bandwidth.

Remote command:
[SENSe:]SWEep:TIME:AUTO on page 217

Sweep Type
Opens a submenu to define the sweep type.

This softkey is available for measuring the Signal Power, the Adjacent Channel Power and the Occupied Bandwidth.

This function is not available in IQ Analyzer mode or for input from the R&S Digital I/Q Interface (option R&S FSV-B17).

In frequency sweep mode, the analyzer provides several possible methods of sweeping:

- "Sweep" on page 96
- "FFT" on page 96 (not available with 5-Pole filters, channel filters or RRC filters, see chapter 3.3.3, "Selecting the Appropriate Filter Type", on page 107)
- "Auto" on page 96

Sweep ← Sweep Type
Sets the Sweep Type to standard analog frequency sweep.

In the standard sweep mode, the local oscillator is set to provide the spectrum quasi analog from the start to the stop frequency.

Remote command:
`SWE:TYPE SWE`, see `[SENSe:]SWEep:TYPE` on page 217

FFT ← Sweep Type
Sets the Sweep Type to FFT mode.

The FFT sweep mode samples on a defined frequency value and transforms it to the spectrum by fast Fourier transformation (FFT).

FFT is not available when using 5-Pole filters, Channel filters or RRC filters. In this case, sweep mode is used.

Note: The same applies when a tracking generator (internal or external, options R&S FSV-B9/B10) is active.

Remote command:
`SWE:TYPE FFT`, see `[SENSe:]SWEep:TYPE` on page 217

Auto ← Sweep Type
Automatically sets the fastest available Sweep Type for the current measurement. Auto mode is set by default.

Remote command:
`SWE:TYPE AUTO`, see `[SENSe:]SWEep:TYPE` on page 217

FFT Filter Mode ← Sweep Type
Defines the filter mode to be used for FFT filters by defining the partial span size. The partial span is the span which is covered by one FFT analysis.

Auto ← FFT Filter Mode ← Sweep Type
The firmware determines whether to use wide or narrow filters to obtain the best measurement results.

Remote command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT` on page 197

Narrow ← FFT Filter Mode ← Sweep Type
For an RBW ≤ 10kHz, the FFT filters with the smaller partial span are used. This allows you to perform measurements near a carrier with a reduced reference level due to a narrower analog prefilter.

Remote command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT` on page 197

Sweep Count
Opens an edit dialog box to enter the number of sweeps to be performed in the single sweep mode. Values from 0 to 32767 are allowed. If the values 0 or 1 are set, one sweep is performed. The sweep count is applied to all the traces in a diagram.

If the trace configurations "Average", "Max Hold" or "Min Hold" are set, the sweep count value also determines the number of averaging or maximum search procedures.

In continuous sweep mode, if sweep count = 0 (default), averaging is performed over 10 sweeps. For sweep count =1, no averaging, maxhold or minhold operations are performed.

Remote command:
`[SENSe:]SWEep:COUNt` on page 212

Sweep Points
Opens an edit dialog box to enter the number of measured values to be collected during one sweep.

- Entry via rotary knob:
  - In the range from 101 to 1001, the sweep points are increased or decreased in steps of 100 points.
  - In the range from 1001 to 32001, the sweep points are increased or decreased in steps of 1000 points.
- Entry via keypad:
  All values in the defined range can be set.

The default value is 691 sweep points.

This softkey is available for RF measurements.

Remote command:
`[SENSe:]SWEep:POINts` on page 216

3.2.7.7 Softkeys of the Input/Output Menu for RF Measurements

The following chapter describes all softkeys available in the "Input/Output" menu for RF measurements. For CDA measurements, see chapter 3.1.1.8, "Softkeys of the Input/Output Menu for CDA Measurements", on page 47.

Input (AC/DC).....103
Noise Source.....103
Video Output.....103
Power Sensor.....103
Trigger Out.....103

Input (AC/DC)
Toggles the RF input of the R&S FSV between AC and DC coupling.

This function is not available for input from the R&S Digital I/Q Interface (option R&S FSV-B17).

Remote command:
`INPut:COUPling` on page 226

Noise Source
Switches the supply voltage for an external noise source on or off. For details on connectors refer to the R&S FSV Quick Start Guide, "Front and Rear Panel" chapter.

Remote command:
`DIAGnostic<n>:SERVice:NSOurce` on page 234

Video Output
Sends a video output signal according to the measured level to the connector on the rear panel of the R&S FSV.

Note: Video output does not return valid values in IQ or FFT mode.

Remote command:
`OUTP:IF VID`, see `OUTPut:IF[:SOURce]` on page 237

Power Sensor
For precise power measurement a power sensor can be connected to the instrument via the front panel (USB connector) or the rear panel (power sensor, option R&S FSV-B5). The Power Sensor Support firmware option (R&S FSV-K9) provides the power measurement functions for this test setup.

This softkey is only available if the R&S FSV option Power Sensor (R&S FSV-K9) is installed.

For details see the chapter "Instrument Functions Power Sensor (K9)" in the base unit description.

This softkey is available for RF measurements.

Trigger Out
Sets the Trigger Out port in the Additional Interfaces (option R&S FSV-B5 only) to low or high. Thus, you can trigger an additional device via the external trigger port, for example.

This softkey is available for RF measurements.

Remote command:
`OUTPut:TRIGger` on page 237

3.3 Further Information

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3.3.1 Detector Overview

The measurement detector for the individual display modes can be selected directly by the user or set automatically by the R&S FSV. The detector activated for the specific trace is indicated in the corresponding trace display field by an abbreviation.

The detectors of the R&S FSV are implemented as pure digital devices. They collect signal power data within each measured point during a sweep. The default number of sweep points is 691. The following detectors are available:

Table 3-1: Detector types

Detector	Indicator	Function
Auto Peak	Ap	Determines the maximum and the minimum value within a measurement point (not available for SEM)
Positive Peak	Pk	Determines the maximum value within a measurement point
Negative Peak (min peak)	Mi	Determines the minimum value within a measurement point
RMS	Rm	Determines the root mean square power within a measurement point
Average	Av	Determines the linear average power within a measurement point
Sample	Sa	Selects the last value within a measurement point

The result obtained from the selected detector within a measurement point is displayed as the power value at this measurement point.

All detectors work in parallel in the background, which means that the measurement speed is independent of the detector combination used for different traces.

Number of measured values

During a frequency sweep, the R&S FSV increments the first local oscillator in steps that are smaller than approximately 1/10 of the bandwidth. This ensures that the oscillator step speed is conform to the hardware settling times and does not affect the precision of the measured power.

The number of measured values taken during a sweep is independent of the number of oscillator steps. It is always selected as a multiple or a fraction of 691 (= default number of trace points displayed on the screen). Choosing less then 691 measured values (e.g. 125 or 251) will lead to an interpolated measurement curve, choosing more than 691 points (e.g. 1001, 2001 …) will result in several measured values being overlaid at the same frequency position.

RMS detector and VBW

If the RMS detector is selected, the video bandwidth in the hardware is bypassed. Thus, duplicate trace averaging with small VBWs and RMS detector no longer occurs. However, the VBW is still considered when calculating the sweep time. This leads to a longer sweep time for small VBW values. Thus, you can reduce the VBW value to achieve more stable trace curves even when using an RMS detector. Normally, if the RMS detector is used the sweep time should be increased to get more stable trace curves.

3.3.2 Trace Mode Overview

The traces can be activated individually for a measurement or frozen after completion of a measurement. Traces that are not activate are hidden. Each time the trace mode is changed, the selected trace memory is cleared.

The R&S FSV offers 6 different trace modes:

Clear Write

Overwrite mode: the trace is overwritten by each sweep. This is the default setting.

All available detectors can be selected.

Remote command:

`DISP:TRAC:MODE WRIT`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 172

Max Hold

The maximum value is determined over several sweeps and displayed. The R&S FSV saves the sweep result in the trace memory only if the new value is greater than the previous one.

The detector is automatically set to "Positive Peak".

This mode is especially useful with modulated or pulsed signals. The signal spectrum is filled up upon each sweep until all signal components are detected in a kind of envelope.

This mode is not available for statistics measurements.

Remote command:
DISP:TRAC:MODE MAXH, see DISPlay[:WINDow<n>]:TRACe<t>:MODE on page 172

Min Hold
The minimum value is determined from several measurements and displayed. The R&S FSV saves the smallest of the previously stored/currently measured values in the trace memory.

The detector is automatically set to "Negative Peak".

This mode is useful e.g. for making an unmodulated carrier in a composite signal visible. Noise, interference signals or modulated signals are suppressed whereas a CW signal is recognized by its constant level.

This mode is not available for statistics measurements.

Remote command:
DISP:TRAC:MODE MINH, see DISPlay[:WINDow<n>]:TRACe<t>:MODE on page 172

Average
The average is formed over several sweeps. The Sweep Count determines the number of averaging procedures.

All available detectors can be selected. If the detector is automatically selected, the sample detector is used (see chapter 3.3.1, "Detector Overview", on page 104).

This mode is not available for statistics measurements.

Remote command:
DISP:TRAC:MODE AVER, see DISPlay[:WINDow<n>]:TRACe<t>:MODE on page 172

View
The current contents of the trace memory are frozen and displayed.

Note: If a trace is frozen, the instrument settings, apart from level range and reference level (see below), can be changed without impact on the displayed trace. The fact that the displayed trace no longer matches the current instrument setting is indicated by the icon on the tab label.

If the level range or reference level is changed, the R&S FSV automatically adapts the measured data to the changed display range. This allows an amplitude zoom to be made after the measurement in order to show details of the trace.

Remote command:
DISP:TRAC:MODE VIEW, see DISPlay[:WINDow<n>]:TRACe<t>:MODE on page 172

Blank
Hides the selected trace.

Remote command:
DISP:TRAC OFF, see DISPlay[:WINDow<n>]:TRACe<t>[:STATe] on page 172

3.3.3 Selecting the Appropriate Filter Type

All resolution bandwidths are realized with digital filters.

The video filters are responsible for smoothing the displayed trace. Using video bandwidths that are small compared to the resolution bandwidth, only the signal average is displayed and noise peaks and pulsed signals are repressed. If pulsed signals are to be measured, it is advisable to use a video bandwidth that is large compared to the resolution bandwidth (VBW * 10 x RBW) for the amplitudes of pulses to be measured correctly.

The following filter types are available:

- Normal (3dB) (Gaussian) filters
  The Gaussian filters are set by default. The available bandwidths are specified in the data sheet.
- CISPR (6 dB) filters
- MIL Std (6 dB) filters
  Note that the 6 dB bandwidths are available only with option R&S FSV-K54.
- Channel filters
  For details see chapter 3.3.4, "List of Available RRC and Channel Filters", on page 107 .
  Channel filters do not support FFT mode.
- RRC filters
  For details see chapter 3.3.4, "List of Available RRC and Channel Filters", on page 107 .
  RRC filters do not support FFT mode.
- 5-Pole filters
  The available bandwidths are specified in the data sheet.
  5-Pole filters do not support FFT mode.

3.3.4 List of Available RRC and Channel Filters

For power measurement a number of especially steep-edged channel filters are available (see the following table). The indicated filter bandwidth is the 3 dB bandwidth. For RRC filters, the fixed roll-off factor (a) is also indicated.

Table 3-2: Filter types

Filter Bandwidth	Filter Type	Application
100 Hz	CFILter	
200 Hz	CFILter	A0
300 Hz	CFILter	
500 Hz	CFILter	
1 kHz	CFILter	
1.5 kHz	CFILter	
2 kHz	CFILter	

Filter Bandwidth	Filter Type	Application
2.4 kHz	CFILter	SSB
2.7 kHz	CFILter	
3 kHz	CFILter	
3.4 kHz	CFILter	
4 kHz	CFILter	DAB, Satellite
4.5 kHz	CFILter	
5 kHz	CFILter	
6 kHz	CFILter	
6 kHz, a=0.2	RRC	APCO
8.5 kHz	CFILter	ETS300 113 (12.5 kHz channels)
9 kHz	CFILter	AM Radio
10 kHz	CFILter	
12.5 kHz	CFILter	CDMAone
14 kHz	CFILter	ETS300 113 (20 kHz channels)
15 kHz	CFILter	
16 kHz	CFILter	ETS300 113 (25 kHz channels)
18 kHz, a=0.35	RRC	TETRA
20 kHz	CFILter	
21 kHz	CFILter	PDC
24.3 kHz, a=0.35	RRC	IS 136
25 kHz	CFILter	
30 kHz	CFILter	CDPD, CDMAone
50 kHz	CFILter	
100 kHz	CFILter	
150 kHz	CFILter	FM Radio
192 kHz	CFILter	PHS
200 kHz	CFILter	
300 kHz	CFILter	
500 kHz	CFILter	J.83 (8-VSB DVB, USA)
1 MHz	CFILter	CDMAone

Filter Bandwidth	Filter Type	Application
1.228 MHz	CFILter	CDMAone
1.28 MHz, a=0.22	RRC	
1.5 MHz	CFILter	DAB
2 MHz	CFILter	
3 MHz	CFILter	
3.75 MHz	CFILter	
3.84 MHz, a=0.22	RRC	W-CDMA 3GPP
4.096 MHz, a=0.22	RRC	W-CDMA NTT DOCoMo
5 MHz	CFILter	
20 MHz	CFILter	
28 MHz	CFILter	
40 MHz	CFILter	

3.3.5 Ranges and Range Settings

In the Spectrum Emission Mask measurements, a range defines a segment for which you can define the following parameters separately:

- Start and stop frequency
- RBW
- VBW
- Sweep time
- Sweep points
- Reference level
- Attenuator settings
- Limit values

Via the sweep list, you define the ranges and their settings. For details on settings refer to "Sweep List dialog box" on page 67.

For details on defining the limits (masks) see the base unit description "Working with Lines in SEM".

The following rules apply to ranges:

- The minimum span of a range is 20 Hz.
- The individual ranges must not overlap (but need not directly follow one another).
- The maximum number of ranges is 20.
- A minimum of three ranges is mandatory.
- The reference range cannot be deleted (it is marked in blue color).
- The reference range has to be centered on the center frequency.

- The minimum span of the reference range is given by the current TX Bandwidth.
- Frequency values for each range have to be defined relative to the center frequency.

In order to change the start frequency of the first range or the stop frequency of the last range, select the appropriate span with the SPAN key. If you set a span that is smaller than the overall span of the ranges, the measurement includes only the ranges that lie within the defined span and have a minimum span of 20 Hz. The first and last ranges are adapted to the given span as long as the minimum span of 20 Hz is not violated.

Symmetrical ranges

You can easily define a sweep list with symmetrical range settings, i.e. the ranges to the left and right of the center range are defined symmectrically. In the "Sweep List" menu, select the "Symmetrical Setup" softkey to activate symmetrical setup mode. The current sweep list configuration is changed to define a symmetrical setup regarding the reference range. The number of ranges to the left of the reference range is reflected to the right, i.e. any missing ranges on the right are inserted, while superfluous ranges are removed. The values in the ranges to the right of the reference range are adapted symmetrically to those in the left ranges.

For details see "Symmetric Setup" on page 70.

Symmetrical ranges fulfull the conditions required for "Fast SEM" mode (see chapter 3.3.9, "Fast Spectrum Emission Mask Measurements", on page 119).

3.3.6 ASCII File Export Format

The data of the file header consist of three columns, each separated by a semicolon: parameter name; numeric value; basic unit. The data section starts with the keyword "Trace <n>" (<n> = number of stored trace), followed by the measured data in one or several columns (depending on measurement) which are also separated by a semicolon.

File contents: header and data section	Description
Type;FSV;	Instrument model
Version;1.50;	Firmware version
Date;01.Apr 2010;	Date of data set storage
Screen;A;	Instrument mode
Points per Symbol;4;	Points per symbol
x Axis Start;-13;sym;	Start value of the x axis
x Axis Stop;135;sym;	Stop value of the x axis
Ref value y axis;-10.00;dBm;	Y axis reference value
Ref value position;100;%;	Y axis reference position
Trace;1;	Trace number
Meas;Result;	Result type
Meas Signal;Magnitude;	Result display

File contents: header and data section	Description
Demodulator;Offset QPSK;	Demodulation type
ResultMode;Trace;	Result mode
x unit;sym;	Unit of the x axis
y unit;dBm;	Unit of the y axis
Trace Mode;Clear Write;	Trace mode
Values;592;	Number of results
<values>	List of results

3.3.7 Format Description of Spectrum Emission Mask XML Files

The files for importing range settings are in XML format and therefore obey the rules of the XML standard. Below, the child nodes, attributes, and structure defined for the data import is described. Build your own XML files according to these conventions because the R&S FSV can only interpret XML files of a known structure. For example files look in the `C:\r_s\instr\sem_std` directory.

Spectrum Emission Mask		Standard: W-CDMA 3GPP (39,43)dBm DL				
Tx Power -47.93 dBm			Tx Bandwidth 3.840 MHz		RBW 30.000 kHz	
Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-12.750 MHz	-8.000 MHz	1.000 MHz	14.99094 GHz*	-74.76 dBm*	-26.83 dB*	27.67 dB*
-8.000 MHz	-4.000 MHz	1.000 MHz	14.99598 GHz	-36.79 dBm	11.14 dB	-25.29 dB
-4.000 MHz	-3.515 MHz	30.000 kHz	14.99628 GHz	-100.18 dBm	-52.25 dB	-75.68 dB
-3.515 MHz	-2.715 MHz	30.000 kHz	14.99648 GHz	-103.55 dBm	-55.63 dB	-79.05 dB
-2.715 MHz	-2.515 MHz	30.000 kHz	14.99747 GHz	-108.91 dBm	-60.98 dB	-96.41 dB
2.515 MHz	2.715 MHz	30.000 kHz	15.00251 GHz	-48.25 dBm	-0.32 dB	-35.75 dB
2.715 MHz	3.515 MHz	30.000 kHz	15.00272 GHz	-52.48 dBm	-4.56 dB	-39.98 dB
3.515 MHz	4.000 MHz	30.000 kHz	15.00398 GHz	-74.53 dBm	-26.60 dB	-50.03 dB
4.000 MHz	8.000 MHz	1.000 MHz	15.00769 GHz	-74.76 dBm	-26.83 dB	-63.26 dB
8.000 MHz	12.750 MHz	1.000 MHz	15.01273 GHz*	-36.79 dBm*	11.14 dB*	65.64 dB*

Fig. 3-2: Example Spectrum emission mask standard file (PowerClass_39_43.xml)

Be sure to follow the structure exactly as shown below or else the R&S FSV is not able to interpret the XML file and error messages are shown on the screen. Therefore, we recommend you make a copy of an existing file (see Save As Standard softkey) and edit the copy of the file.

Alternatively, edit the settings using the "Spectrum Emission Mask" softkey and the Sweep List dialog box and save the XML file with the Save As Standard softkey afterwards. This way, no modifications have to be done in the XML file itself.

Basically, the file consists of three elements that can be defined:

- The "BaseFormat" element
- The "PowerClass" element
- The "Range" element

The "BaseFormat" element

It carries information about basic settings. In this element only the "ReferencePower" child node has any effects on the measurement itself. The other attributes and child nodes are used to display information about the Spectrum Emission Mask Standard on the measurement screen. The child nodes and attributes of this element are shown in table 3-3.

In the example above (`PowerClass_39_43.xml` under `C:\r_s\instr\sem_std\WCDMA\3GPP`, see figure 3-2), these attributes are defined as follows:

- Standard="W-CDMA 3GPP"
- LinkDirection="DL"
- PowerClass="(39,43)dBm"

The "PowerClass" element

It is embedded in the "BaseFormat" element and contains settings information about the power classes. Up to four different power classes can be defined. For details refer to the "Sweep List" softkey ("Sweep List" on page 67) and the corresponding parameter description. The child nodes and attributes of this element are shown in table 3-4.

The "Range" element

This element is embedded in the "PowerClass" element. It contains the settings information of the range. There have to be at least three defined ranges: one reference range and at least one range to either side of the reference range. The maximum number of ranges is 20. Note that the R&S FSV uses the same ranges in each power class. Therefore, the contents of the ranges of each defined power class have to be identical to the first power class. An exception are the Start and Stop values of the two Limit nodes that are used to determine the power class. Note also, that there are two Limit nodes to be defined: one that gives the limit in absolute values and one in relative values. Make sure units for the Start and Stop nodes are identical for each Limit node.

For details refer to the "Sweep List" softkey ("Sweep List" on page 67) and the corresponding parameter description. The child nodes and attributes of this element are shown in table 3-5.

The following tables show the child nodes and attributes of each element and show if a child node or attribute is mandatory for the R&S FSV to interpret the file or not. Since the hierarchy of the XML can not be seen in the tables, either view one of the default files already stored on the R&S FSV in the "`C:\r_s\instr\sem_std`" directory or check the structure as shown below.

Below, a basic example of the structure of the file is shown, containing all mandatory attributes and child nodes. Note that the "PowerClass" element and the range element are themselves elements of the "BaseFormat" element and are to be inserted where noted. The separation is done here simply for reasons of a better overview. Also, no example values are given here to allow a quick reference to the tables above. Italic font shows the placeholders for the values.

- The "BaseFormat" element is structured as follows:

– <RS_SEM_ACP_FileFormat Version=""1.0.0.0"">
<Name>"Standard"</Name>
<Instrument>
<Type>"Instrument Type"</Type>
<Application>"Application"</Application>
</Instrument>
<LinkDirection Name=""Name"">
<ReferencePower>
<Method>"Method"</Method>
</ReferencePower>
<PowerClass Index=""n"">
<!-- For contents of the PowerClass node see table 3-4 -->
<!-- Define up to four PowerClass nodes -->
</PowerClass>
</LinkDirection>
</RS_SEM_ACP_File>

- The "PowerClass" element is structured as follows:
  – <PowerClass Index=""n"">
  <StartPower Unit=""dBm"" InclusiveFlag=""true"" Value=""StartPowerValue""/>
  <StopPower Unit=""dBm"" InclusiveFlag=""false"" Value=""StopPowerValue""/>
  <DefaultLimitFailMode>"Limit Fail Mode"</DefaultLimitFailMode>
  <Range Index=""n"">
  <!-- For contents of the Range node see table 3-5 -->
  <!-- Define up to twenty Range nodes -->
  </Range>
  …
  </PowerClass>
- The "Range" element is structured as follows:
  – <Range Index=""n"">
  <Name=""Name"">
  <ChannelType>"Channel Type"</Channel Type>
  <WeightingFilter>
  <Type>"FilterType"</Type>
  <RollOffFactor>"Factor"</RollOffFactor>
  <Bandwith>"Bandwidth"</Bandwidth>
  </WeightingFilter>
  <FrequencyRange>
  <Start>"RangeStart"</Start>
  <Stop>"RangeStop"</Stop>
  </FrequencyRange>
  <Limit>
  <Start Unit=""Unit"" Value=""Value""/>
  <Stop Unit=""Unit"" Value=""Value""/>
  </Limit>
  <Limit>
  <Start Unit=""Unit"" Value=""Value""/>
  <Stop Unit=""Unit"" Value=""Value""/>
  </Limit>

```
<RBW Bandwidth=""Bandwidth"" Type=""FilterType""/>
<VBW Bandwidth=""Bandwidth""/>
<Detector>"Detector"</Detector>
<Sweep Mode=""SweepMode"" Time=""SweepTime""/>
<Amplitude>
<ReferenceLevel Unit=""dBm"" Value=""Value""/>
<RFAttenuation Mode=""Auto"" Unit=""dB"" Value=""Value""/>
<Preamplifier State=""State""/>
</Amplitude>
</Range>
```

Table 3-3: Attributes and child nodes of the BaseFormat element

Child Node	Attribute	Value	Parameter Description	Mand.
	FileFormatVersion	1.0.0.0		Yes
	Date	YYYY-MM-DD HH:MM:SS	Date in ISO 8601 format	No
Name		<string>	Name of the standard	Yes
Instrument	Type	FSL	Name of the instrument	No
	Application	SA | K72 | K82	Name of the application	No
LinkDirection	Name	Downlink | Uplink | None		Yes
	ShortName	DL | UL		No
Reference-Power				Yes
Method	TX Channel Power | TX Channel Peak Power			Yes
Reference-Channel	<string>			No

Table 3-4: Attributes and child nodes of the PowerClass element

Child Node	Attribute	Value	Parameter Description	Mand.
StartPower	Value	<power in dBm>	The start power must be equal to the stop power of the previous power class. The StartPower value of the first range is -200	Yes
	Unit	dBm		Yes
	InclusiveFlag	true		Yes
StopPower	Value	<power in dBm>	The stop power must be equal to the start power of the next power class. The StopPower value of the last range is 200	Yes
	Unit	dBm		

Child Node	Attribute	Value	Parameter Description	Mand.
	InclusiveFlag	false		Yes
DefaultLimitFailMode		Absolute | Relative | Absolute and Relative | Absolute or Relative		Yes

Table 3-5: Attributes and child nodes of the Range element (normal ranges)

Child Node	Attribute	Value	Parameter Description	Mand.
	Index	0…19	Inde XE s are continuous and have to start with 0	Yes
	Name	<string>	Name of the range	Only if ReferenceChannel contains a name and the range is the reference range
	Short-Name	<string>	Short name of the range	No
ChannelType		TX | Adjacent		Yes
WeightingFilter				Only if ReferencePower method is TX Channel Power and the range is the reference range
Type		RRC | CFilter	Type of the weighting filter	Yes
Roll Off Factor		0…1	Excess bandwidth of the filter	Only if the filter type is RRC
Bandwidth		<bandwidth in Hz>	Filter bandwidth	Only if the filter type is RRC
FrequencyRange				Yes
Start		<frequency in Hz>	Start value of the range	Yes
Stop		<frequency in Hz>	Stop value of the range	Yes
Limit		dBm/Hz | dBm | dBc | dBr | dB	A Range must contain exactly two limit nodes; one of the limit nodes has to have a relative unit (e.g. dBc), the other one must have an absolute unit (e.g. dBm)	Yes
Start	Value	<numeric_value>	Power limit at start frequency	Yes
	Unit	dBm/Hz | dBm | dBc | dBr | dB	Sets the unit of the start value	
Stop	Value	<numeric_value>	Power limit at stop frequency	
	Unit	dBm/Hz | dBm | dBc | dBr | dB	Sets the unit of the stop value	

Child Node	Attribute	Value	Parameter Description	Mand.
LimitFailMode		Absolute | Relative | Absolute and Relative | Absolute or Relative	If used, it has to be identical to DefaultLimitFailMode	No
RBW	Bandwidth	<bandwidth in Hz>	"RBW" on page 68	Yes
	Type	NORM | PULS | CFIL | RRC		No
VBW	Bandwidth	<bandwidth in Hz>	"VBW" on page 68	Yes
Detector		NEG | POS | SAMP | RMS | AVER | QUAS	If used, it has to be identical in all ranges.	No
Sweep	Mode	Manual | Auto	"Sweep Time Mode" on page 68	Yes
	Time	<time in sec>	"Sweep Time" on page 68	No
Amplitude				No
ReferenceLevel	Value	<power in dBm>	"Ref. Level" on page 68	Yes, if the ReferenceLevel child node is used
	Unit	dBm	Defines dBm as unit	Yes, if the ReferenceLevel node is used
RFAttenuation	Mode	Manual | Auto	"RF Att. Mode" on page 68	Yes, if the ReferenceLevel child node is used
Preamplifier		ON | OFF	"Preamp" on page 69	Yes

3.3.8 Provided XML Files for the Spectrum Emission Mask Measurement

You can change the settings manually or via XML files. The XML files offer a quick way to change the configuration. A set of ready-made XML files for different standards is already provided. For details see table 3-6. You can also create and use your own XML files (for details see chapter 3.3.7, "Format Description of Spectrum Emission Mask XML Files", on page 111). All XML files are stored under "`C:\r_s\instr\sem_std`". Use the "Load Standard" softkey for quick access to the available XML files (see "Load Standard" on page 74).

Table 3-6: Provided XML files

Path	XML file name	Displayed standard characteristics*
cdma2000\DL	default0.xml	CDMA2000 BC0 DL
	default1.xml	CDMA2000 BC1 DL
cdma2000\UL	default0.xml	CDMA2000 BC0 UL
	default1.xml	CDMA2000 BC1 UL

Path	XML file name	Displayed standard characteristics*
WCDMA\3GPP\DL	PowerClass_31_39.xml	W-CDMA 3GPP (31,39)dBm DL
	PowerClass_39_43.xml	W-CDMA 3GPP (39,43)dBm DL
	PowerClass_43_INF.xml	W-CDMA 3GPP (43,INF)dBm DL
	PowerClass_negINF_31.xml	W-CDMA 3GPP (-INF,31)dBm DL
WIBRO\DL	PowerClass_29_40.xml	WiBro TTA (29,40)dBm DL
	PowerClass_40_INF.xml	WiBro TTA (40,INF)dBm DL
	PowerClass_negINF_29.xml	WiBro TTA (-INF,29)dBm DL
WIBRO\UL	PowerClass_23_INF.xml	WiBro TTA (23,INF)dBm UL
	PowerClass_negINF_23.xml	WiBro TTA (23,INF)dBm UL
WIMAX\DL\ETSI\…MHz (1.75 MHz, 2.00 MHz, 3.5 MHz, 7.00 MHz, 14.00 MHz, 28 MHz)	System_Type_E.xml	WIMAX System Type E DL
	System_Type_F.xml	WIMAX System Type F DL
	System_Type_G.xml	WIMAX System Type G DL
WIMAX\DL\IEEE	10MHz.xml	WIMAX 10MHz DL
	20MHz.xml	WIMAX 20MHz DL
WIMAX\UL\ETSI…MHz (1.75 MHz, 2.00 MHz, 3.5 MHz, 7.00 MHz, 14.00 MHz, 28 MHz)	System_Type_E.xml	WIMAX System Type E UL
	System_Type_F.xml	WIMAX System Type F UL
	System_Type_G.xml	WIMAX System Type G UL
WIMAX\UL\IEEE	10MHz.xml	WIMAX 10MHz UL
	20MHz.xml	WIMAX 20MHz UL
WLAN\802_11_TURBO	ETSI.xml	IEEE 802.11
	IEEE.xml	IEEE 802.11
WLAN\802_11a	ETSI.xml	IEEE 802.11a
	IEEE.xml	IEEE 802.11a
WLAN\802_11b	IEEE.xml	IEEE 802.11b
WLAN\802_11j_10MHz	ETSI.xml	IEEE.802.11j
	IEEE.xml	IEEE.802.11j
WLAN\802_11j_20MHz	ETSI.xml	IEEE 802.11j
	IEEE.xml	IEEE 802.11j
EUTRA-LTE\DL\CategoryA\	BW_01_4_MHz__CFhigher1GHz.xml	LTE Cat. A >1GHz DL

Path	XML file name	Displayed standard characteristics*
EUTRA-LTE\DL\CategoryA\	BW_01_4_MHz__CFlower1GHz.xml	LTE Cat. A <1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_03_0_MHz__CFhigher1GHz.xml	LTE Cat. A >1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_03_0_MHz__CFlower1GHz.xml	LTE Cat. A <1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_05_0_MHz__CFhigher1GHz.xml	LTE Cat. A >1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_05_0_MHz__CFlower1GHz.xml	LTE Cat. A <1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_10_0_MHz__Cfhigher1GHz.xml	LTE Cat. A >1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_10_0_MHz__Cflower1GHz.xml	LTE Cat. A >1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_15_0_MHz__CFhigher1GHz.xml	LTE Cat. A >1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_15_0_MHz__CFlower1GHz.xml	LTE Cat. A <1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_20_0_MHz__CFhigher1GHz.xml	LTE Cat. A >1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_20_0_MHz__CFlower1GHz.xml	LTE Cat. A <1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_01_4_MHz__CFhigher1GHz.xml	LTE Cat. B >1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_01_4_MHz__CFlower1GHz.xml	LTE Cat. B <1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_03_0_MHz__CFhigher1GHz.xml	LTE Cat. B >1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_03_0_MHz__CFlower1GHz.xml	LTE Cat. B <1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_05_0_MHz__CFhigher1GHz.xml	LTE Cat. B >1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_05_0_MHz__CFlower1GHz.xml	LTE Cat. B <1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_10_0_MHz__Cfhigher1GHz.xml	LTE Cat. B >1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_10_0_MHz__Cflower1GHz.xml	LTE Cat. B >1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_15_0_MHz__CFhigher1GHz.xml	LTE Cat. B >1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_15_0_MHz__CFlower1GHz.xml	LTE Cat. B <1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_20_0_MHz__CFhigher1GHz.xml	LTE Cat. B >1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_20_0_MHz__CFlower1GHz.xml	LTE Cat. B <1GHz DL
EUTRA-LTE\UL\Standard\	BW_05_0_MHz.xml	LTE UL
EUTRA-LTE\UL\Standard\	BW_10_0_MHz.xml	LTE UL
EUTRA-LTE\UL\Standard\	BW_15_0_MHz.xml	LTE UL
EUTRA-LTE\UL\Standard\	BW_20_0_MHz.xml	LTE UL

*Used abbreviations:

BC: band class

UL: uplink

DL: downlink

TTA: Telecommunications Technology Association

3.3.9 Fast Spectrum Emission Mask Measurements

In order to improve the performance of the R&S FSV for spectrum emission mask measurements, a "Fast SEM" mode is available. If this mode is activated, several consecutive ranges with identical sweep settings are combined to one sweep internally, which makes the measurement considerably more efficient. The displayed results remain unchanged and still consist of several ranges. Thus, measurement settings that apply only to the results, such as limits or transducer factors, can nevertheless be defined individually for each range.

Prerequisites

"Fast SEM" mode is available if the following criteria apply:

- The frequency ranges are consecutive, without frequency gaps
- The following sweep settings are identical:
  - "Filter Type", see "Filter Type" on page 68
  - "RBW", see "RBW" on page 68
  - "VBW", see "VBW" on page 68
  - "Sweep Time Mode", see "Sweep Time Mode" on page 68
  - "Ref Level", see "Ref. Level" on page 68
  - "Rf Att. Mode", see "RF Att. Mode" on page 68
  - "RF Attenuator", see "RF Att. Mode" on page 68
  - "Preamp", see "Preamp" on page 69

Activating Fast SEM mode

"Fast SEM" mode is activated in the sweep list (see "Fast SEM" on page 67) or using a remote command. Activating the mode for one range automatically activates it for all ranges in the sweep list.

In the provided XML files for the Spectrum Emission Mask measurement, "Fast SEM" mode is activated by default.

SCPI command:

`[SENSe:]ESPectrum:HighSPeed` on page 187

Consequences

When the "Fast SEM" mode is activated, the ranges for which these criteria apply are displayed as one single range. The sweep time is defined as the sum of the individual

sweep times, initially, but can be changed. When the "Fast SEM" mode is deactivated, the originally defined individual sweep times are reset.

If "Symmetrical Setup" mode is active when "Fast SEM" mode is activated, not all sweep list settings can be configured symmetrically automatically (see also "Symmetric Setup" on page 70).

Any other changes to the sweep settings of the combined range are applied to each included range and remain changed even after deactivating "Fast SEM" mode.

Example

Sweep List

	Range 1	Range 2	Range 3	Range 4	Range 5
Range Start	-12.75 MHz	-8 MHz	-4 MHz	-3.515 MHz	-2.715 MHz
Range Stop	-8 MHz	-4 MHz	-3.515 MHz	-2.715 MHz	-2.515 MHz
Fast SEM	On	On	On	On	On
Filter Type	Channel	---	Gaussian	---	---
RBW	1 MHz	---	30 kHz	---	---
VBW	10 MHz	---	10 MHz	---	---
Sweep Time Mode	---	---	---	---	---
Sweep Time	10 ms	---	30 ms	---	---
Ref. Level	-10 dBm	---	-10 dBm	---	---
RF Att. Mode	Auto	---	Auto	---	---
RF Attenuator	10 dB	---	10 dB	---	---
Preamp	Off	---	Off	---	---
Transd. Factor	None	None	None	None	None
Limit Check 1	Absolute	Absolute	Absolute	Absolute	Absolute
Abs Limit Start 1	-23.5 dBm	-19.5 dBm	-32.5 dBm	-32.5 dBm	-20.5 dBm
Abs Limit Stop 1	-23.5 dBm	-19.5 dBm	-32.5 dBm	-20.5 dBm	-20.5 dBm
Rel Limit Start 1	-50 dBc	-50 dBc	-50 dBc	-50 dBc	-50 dBc
Rel Limit Stop 1	-50 dBc	-50 dBc	-50 dBc	-50 dBc	-50 dBc
Limit Check 2	Relative	Relative	Relative	Relative	Relative

Fig. 3-3: Sweep list using Fast SEM mode

In figure 3-3, a sweep list is shown for which Fast SEM is activated. The formerly 5 separately defined ranges are combined to 2 sweep ranges internally.

3.3.10 Predefined CP/ACLR Standards

When using predefined standards for ACLR measurement, the test parameters for the channel and adjacent-channel measurements are configured automatically. The available standards are listed below.

Predefined standards are selected using the "CP/ACLR Standard" softkey or the `CALC:MARK:FUNC:POW:PRES` command.

Standard	GUI-Parameter	SCPI-Parameter
EUTRA/LTE Square	EUTRA/LTE Square	EUTRa
EUTRA/LTE Square/RRC	EUTRA/LTE Square/RRC	REUTRa
W-CDMA 3.84 MHz forward	W-CDMA 3GPP FWD	FW3G
W-CDMA 3.84 MHz reverse	W-CDMA 3GPP REV	RW3G
CDMA IS95A forward	CDMA IS95A FWD	F8CD | FIS95a
CDMA IS95A reverse	CDMA IS95A REV	R8CD | RIS95a
CDMA IS95C Class 0 forward*)	CDMA IS95C Class 0 FWD	FIS95c0
CDMA IS95C Class 0 reverse*)	CDMA IS95C Class 0 REV	RIS95c0
CDMA J-STD008 forward	CDMA J-STD008 FWD	F19C | FJ008
CDMA J-STD008 reverse	CDMA J-STD008 REV	R19C | RJ008
CDMA IS95C Class 1 forward*)	CDMA IS95C Class 1 FWD	FIS95c1
CDMA IS95C Class 1 reverse*)	CDMA IS95C Class 1 REV	RIS95c1
CDMA 2000	CDMA 2000	S2CD
TD-SCDMA forward	TD SCDMA FWD	FTCD | TCDMa
TD-SCDMA reverse	TD SCDMA REV	RTCD
WLAN 802.11A	WLAN 802.11A	AWLan
WLAN 802.11B	WLAN 802.11B	BWLan
WiMAX	WiMAX	WiMAX
WIBRO	WIBRO	WIBRO
GSM	GSM	GSM
RFID 14443	RFID 14443	RFID14443
TETRA	TETRA	TETRA
PDC	PDC	PDC
PHS	PHS	PHS
CDPD	CDPD	CDPD
APCO-25 Phase 2	APCO-25 P2	PAPCo25

For the R&S FSV, the channel spacing is defined as the distance between the center frequency of the adjacent channel and the center frequency of the transmission channel. The definition of the adjacent-channel spacing in standards IS95C and CDMA 2000 is different. These standards define the adjacent-channel spacing from the center of the transmission channel to the closest border of the adjacent channel. This definition is also used for the R&S FSV if the standards marked with an asterisk ***)** are selected.

3.3.11 Optimized Settings for CP/ACLR Test Parameters

The "Adjust Settings" softkey (see "Adjust Settings" on page 64) automatically optimizes all instrument settings for the selected channel configuration, as described in the following:

- **Frequency span**
  The frequency span must at least cover the channels to be measured plus a measurement margin of approx. 10 %.
  If the frequency span is large in comparison to the channel bandwidth (or the adjacent-channel bandwidths) being examined, only a few points on the trace are available per channel. This reduces the accuracy of the waveform calculation for the channel filter used, which has a negative effect on the measurement accuracy. It is therefore strongly recommended that the formulas mentioned be taken into consideration when selecting the frequency span.
  For channel power measurements the Adjust Settings softkey sets the frequency span as follows:
  "(No. of transmission channels – 1) x transmission channel spacing + 2 x transmission channel bandwidth + measurement margin"
  For adjacent-channel power measurements, the Adjust Settings softkey sets the frequency span as a function of the number of transmission channels, the transmission channel spacing, the adjacent-channel spacing, and the bandwidth of one of adjacent-channels ADJ, ALT1 or ALT2, whichever is furthest away from the transmission channels:
  "(No. of transmission channels – 1) x transmission channel spacing + 2 x (adjacent-channel spacing + adjacent-channel bandwidth) + measurement margin"
  The measurement margin is approx. 10 % of the value obtained by adding the channel spacing and the channel bandwidth.
- **Resolution bandwidth (RBW)**
  To ensure both, acceptable measurement speed and required selection (to suppress spectral components outside the channel to be measured, especially of the adjacent channels), the resolution bandwidth must not be selected too small or too large. As a general approach, the resolution bandwidth is to be set to values between 1% and 4% of the channel bandwidth.
  A larger resolution bandwidth can be selected if the spectrum within the channel to be measured and around it has a flat characteristic. In the standard setting, e.g. for standard IS95A REV at an adjacent channel bandwidth of 30 kHz, a resolution bandwidth of 30 kHz is used. This yields correct results since the spectrum in the neighborhood of the adjacent channels normally has a constant level.
  With the exception of the IS95 CDMA standards, the Adjust Settings softkey sets the resolution bandwidth (RBW) as a function of the channel bandwidth:

"RBW ≤ 1/40 of channel bandwidth"
The maximum possible resolution bandwidth (with respect to the requirement RBW ≤ 1/40) resulting from the available RBW steps (1, 3) is selected.

- **Video bandwidth (VBW)**
  For a correct power measurement, the video signal must not be limited in bandwidth. A restricted bandwidth of the logarithmic video signal would cause signal averaging and thus result in a too low indication of the power (-2.51 dB at very low video bandwidths). The video bandwidth should therefore be selected at least three times the resolution bandwidth:
  "VBW ≥ 3 x RBW"
  The Adjust Settings softkey sets the video bandwidth (VBW) as a function of the channel bandwidth (see formula above) and the smallest possible VBW with regard to the available step size will be selected.
- **Detector**
  The Adjust Settings softkey selects the RMS detector. This detector is selected since it correctly indicates the power irrespective of the characteristics of the signal to be measured. The whole IF envelope is used to calculate the power for each measurement point. The IF envelope is digitized using a sampling frequency which is at least five times the resolution bandwidth which has been selected. Based on the sample values, the power is calculated for each measurement point using the following formula:

  $$P_{RMS} = \sqrt{\frac{1}{N} \cdot \sum_{i=1}^{N} s_i^2}$$

  where:
  "s_i = linear digitized video voltage at the output of the A/D converter"
  "N = number of A/D converter values per measurement point"
  "P_{RMS} = power represented by a measurement point"
  When the power has been calculated, the power units are converted into decibels and the value is displayed as a measurement point.
  In principle, the sample detector would be possible as well. Due to the limited number of measurement points used to calculate the power in the channel, the sample detector would yield less stable results.
- **Trace averaging**
  The Adjust Settings softkey switches off this function. Averaging, which is often performed to stabilize the measurement results, leads to a too low level indication and should therefore be avoided. The reduction in the displayed power depends on the number of averages and the signal characteristics in the channel to be measured.
- **Reference level**
  The Adjust Settings softkey does not influence the reference level. It can be adjusted separately using the "Adjust Ref Lvl" softkey (see "Adjust Ref Lvl" on page 38).

4 Remote Control Commands

This chapter describes the remote commands specific to the TD-SCDMA Analysis option (R&S FSV-K76/K77). The abbreviation TDS stands for the operating mode of this option. For details on conventions used in this chapter refer to chapter 4.1, "Notation", on page 125.

For further information on analyzer or basic settings commands, refer to the corresponding subsystem in the base unit description.

In particular, the following subsystems are identical to the base unit; refer to the base unit description:

- CALCulate:DELTamarker
- CALCulate:MARKer (except for the specific commands described in chapter 4.2, "CALCulate Subsystem", on page 127)
- FORMat subsystem
- INITiate subsystem
- INPut subsystem
- MMEM subsystem
- OUTput subsystem
- SENSe subsystem (except for the specific commands described in chapter 4.6, "SENSe Subsystem", on page 177)
- TRIGger subsystem

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4.1 Notation

In the following sections, all commands implemented in the instrument are first listed and then described in detail, arranged according to the command subsystems. The notation is adapted to the SCPI standard. The SCPI conformity information is included in the individual description of the commands.

Individual Description

The individual description contains the complete notation of the command. An example for each command, the *RST value and the SCPI information are included as well.

The options and operating modes for which a command can be used are indicated by the following abbreviations:

Abbreviation	Description
A	spectrum analysis
A-F	spectrum analysis – span > 0 only (frequency mode)
A-T	spectrum analysis – zero span only (time mode)
ADEMOD	analog demodulation (option R&S FSV-K7)
BT	Bluetooth (option R&S FSV-K8)
CDMA	CDMA 2000 base station measurements (option R&S FSV-K82)
EVDO	1xEV-DO base station analysis (option R&S FSV-K84)
GSM	GSM/Edge measurements (option R&S FSV-K10)
IQ	IQ Analyzer mode
OFDM	WiMAX IEEE 802.16 OFDM measurements (option R&S FSV-K93)
OFDMA/WiBro	WiMAX IEEE 802.16e OFDMA/WiBro measurements (option R&S FSV-K93)
NF	Noise Figure measurements (R&S FSV-K30)
PHN	Phase Noise measurements (R&S FSV-K40)
PSM	Power Sensor measurements (option R&S FSV-K9)
SFM	Stereo FM measurements (optionR&S FSV-K7S)
SPECM	Spectogram mode (option R&S FSV-K14)
TDS	TD-SCDMA base station / UE measurements (option R&S FSV-K76/K77)
VSA	Vector Signal Analysis (option R&S FSV-K70)

WCDMA	3GPP Base Station measurements (option R&S FSV-K72), 3GPP UE measurements (option R&S FSV-K73)
WLAN	WLAN TX measurements (option R&S FSV-K91)

The spectrum analysis mode is implemented in the basic unit. For the other modes, the corresponding options are required.

Upper/Lower Case Notation

Upper/lower case letters are used to mark the long or short form of the key words of a command in the description. The instrument itself does not distinguish between upper and lower case letters.

Special Characters

|	A selection of key words with an identical effect exists for several commands. These keywords are indicated in the same line; they are separated by a vertical stroke. Only one of these keywords needs to be included in the header of the command. The effect of the command is independent of which of the keywords is used.

Example:

```
SENSe:FREQuency:CW|:FIXed
```

The two following commands with identical meaning can be created. They set the frequency of the fixed frequency signal to 1 kHz:

```
SENSe:FREQuency:CW 1E3
```

```
SENSe:FREQuency:FIXed 1E3
```

A vertical stroke in parameter indications marks alternative possibilities in the sense of "or". The effect of the command differs, depending on which parameter is used.

Example: Selection of the parameters for the command

```
[SENSe<1…4>:]AVERage<1…4>:TYPE VIDeo | LINear
```

[]	Key words in square brackets can be omitted when composing the header. The full command length must be accepted by the instrument for reasons of compatibility with the SCPI standards. Parameters in square brackets can be incorporated optionally in the command or omitted as well.

{}	Parameters in braces can be incorporated optionally in the command, either not at all, once or several times.

Description of Parameters

Due to the standardization, the parameter section of SCPI commands consists always of the same syntactical elements. SCPI has therefore specified a series of definitions, which are used in the tables of commands. In the tables, these established definitions are indicated in angled brackets (<…>) and is briefly explained in the following.

For details see the chapter "SCPI Command Structure" in the base unit description.

<Boolean>

This keyword refers to parameters which can adopt two states, "on" and "off". The "off" state may either be indicated by the keyword OFF or by the numeric value 0, the "on" state is indicated by ON or any numeric value other than zero. Parameter queries are always returned the numeric value 0 or 1.

<numeric_value> <num>

These keywords mark parameters which may be entered as numeric values or be set using specific keywords (character data). The following keywords given below are permitted:

- `MAXimum`: This keyword sets the parameter to the largest possible value.
- `MINimum`: This keyword sets the parameter to the smallest possible value.
- `DEFault`: This keyword is used to reset the parameter to its default value.
- `UP`: This keyword increments the parameter value.
- `DOWN`: This keyword decrements the parameter value.

The numeric values associated to MAXimum/MINimum/DEFault can be queried by adding the corresponding keywords to the command. They must be entered following the quotation mark.

Example:

```
SENSe:FREQuency:CENTer? MAXimum
```

Returns the maximum possible numeric value of the center frequency as result.

<arbitrary block program data>

This keyword is provided for commands the parameters of which consist of a binary data block.

4.2 CALCulate Subsystem

The CALCulate subsystem contains commands for converting instrument data, transforming and carrying out corrections. These functions are carried out subsequent to data acquisition, i.e. following the SENSe subsystem.

Note that most commands in the `CALCulate` subsystem are identical to the base unit; only the commands specific to this option are described here.

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4.2.1 CALCulate:FEED Commands

CALCulate<n>:FEED <result display>

This command selects the result display for the code domain analyzer.

Suffix:

<n> 1...4
window

Parameters:

<result display>

'XPOW:CDP'
Code Domain Power result display (absolute)

'XPOW:CDP:RAT'
Code Domain Power result display (relative)

'XPOW:CDEP'
Code Domain Error Power result display

'XTIMe:CDPower:BSTRream'
Channel Bitstream result display

'XTIMe:CDPower:COMPosite:CONSt'
Composite Constellation result display

'XTIMe:CDPower:COMPosite:EVM'
Composite EVM result display

'XTIMe:CDPower:ERRor:CTABle'
Channel Table result display

'XTIMe:CDPower:ERRor:PCDomain'
Peak Code Domain Error result display

'XTIMe:CDPower:ERRor:SUMMary'
Result Summary result display

'XTIMe:CDPower:MACCuracy'
Composite EVM result display

'XTIMe:CDPower:PVSLot'
Channel Power vs Slot result display (absolute)

'XTIMe:CDPower:PVSLot:RATio'
Channel Power vs Slot result display (relative)

'XTIMe:CDPower:PVSYmbol'
Power vs Symbol result display

'XTIMe:CDPower:SYMBol:CONSt'
Channel Constellation result display

'XTIMe:CDPower:SYMBol:EVM'
EVM vs Symbol result display

*RST: 'XPOW:CDP:RAT'

Example:

```
CALC2:FEED 'XTIM:CDP:MACC
```

Starts the Composite EVM result display in window 2.

Mode: TDS

4.2.2 CALCulate:MARKer:FUNCtion Commands

This chapter describes commands of the CALCulate:MARKer subsystem that are specific to the measurement application.

CALCulate<n>:MARKer:FUNCtion:CDPower[:BTS]:RESult?.....130
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CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult?.....132
CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult:PHZ.....133
CALCulate<n>:MARKer<m>:FUNCtion:POWer:SELect.....134

CALCulate<n>:MARKer:FUNCtion:CDPower[:BTS]:RESult? <ResultType>

This command queries the results of the code domain measurement. Refer to the Code Domain Analysis result display for a detailed description of all results.

Suffix:

<n> 1...4
window

Query parameters:

<ResultType> ACTive |
ARCD CDPabsolute CDPRelative CHANnel CERror EVMPeak EVMRMS IQIMbalance IQOFfset MACCuracy PCDerror PCDerror PD1 PD2 PDATa PMIDamble RHO SFACtor SLOT SRATe TFRame

ACTive
Returns the number of active channels.

ARCD
Returns the Average Relative Code Domain Error.

CDPabsolute
Returns the absolute channel power in dBm.

CDPRelative
Returns the relative channel power in dB.

CHANnel
Returns the current channel number.

CERror
Returns the Chip Rate Error in ppm.

EVMPeak
Returns the maximum Error Vector Magnitude of the selected channel.

EVMRMS
Returns the average Error Vector Magnitude of the selected channel.

IQIMbalance
Returns the IQ Imbalance in %.

IQOFfset
Returns the IQ Offset in %.

MACCuracy
Returns the Composite EVM in %.

PCDerror
Returns the Peak Code Domain Error dB.

PD1
Returns the power of the slot's data part 1 in dBm.

PD2
Returns the power of the slot's data part 2 in dBm.

PDATa
Returns the average power of the data parts in dBm.

PMIDamble
Returns the power of the midamble in dBm.

RHO
Returns the parameter Rho.

SFACtor
Returns the spreading factor of the channel.

SLOT

Returns the currently analyzed slot number.

SRATe
Returns the symbol rate in ksps.
Note that TFRame returns a '9' if the trigger is at Free Run.

TFRame
Returns the Trigger to Frame time in seconds.

Example: `CALC:MARK:FUNC:CDP:RES? CERR`
Returns the Chip Rate Error

Usage: Query only

Mode: TDS

CALCulate<n>:MARKer<m>:FUNCtion:POWer:MODE <Mode>

This commands defines the method by which the channel power values are calculated from the current trace in the window specified by the suffix <n>.

Suffix:
<n> Selects the measurement window.

<m> Selects the marker.

Parameters:
<Mode> WRITe | MAXHold

WRITe
The channel power and the adjacent channel powers are calculated directly from the current trace

MAXHold
The power values are calculated from the current trace and compared with the previous power value using a maximum algorithm.

Example: `CALC:MARK:FUNC:POW:MODE MAXH`
Sets the Maxhold channel power mode.

CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult? <ResultType>

This command queries the result of the performed power measurement in the window specified by the suffix <n>. If necessary, the measurement is switched on prior to the query.

The channel spacings and channel bandwidths are configured in the `SENSe:POWer` subsystem.

To obtain a correct result, a complete sweep with synchronization to the end of the sweep must be performed before a query is output. Synchronization is possible only in the single sweep mode.

Suffix:
<n> Selects the measurement window.

<m> Selects the marker.

Parameters:

<ResultType> ACPower | CPOWer

ACPower
Adjacent-channel power measurement
Results are output in the following sequence, separated by commas:
Power of transmission channel
Power of lower adjacent channel
Power of upper adjacent channel
Power of lower alternate channel 1
Power of upper alternate channel 1
Power of lower alternate channel 2
Power of upper alternate channel 2
The number of measured values returned depends on the number of adjacent/alternate channels selected with `[SENSe:]POWer:ACHannel:ACPairs`.
With logarithmic scaling (RANGE "LOG"), the power is output in the currently selected level unit; with linear scaling (RANGE "LIN dB" or "LIN %"), the power is output in W. If `[SENSe:]POWer:ACHannel:MODE` is set to "REL", the adjacent/alternate-channel power is output in dB.

CPOWer
Channel power measurement
In a Spectrum Emission Mask measurement, the query returns the power result for the reference range, if this power reference type is selected.
With logarithmic scaling (RANGE LOG), the channel power is output in the currently selected level unit; with linear scaling (RANGE LIN dB or LIN %), the channel power is output in W.

CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult:PHZ <State>

This command switches the query response of the power measurement results between output of absolute values and output referred to the measurement bandwith.

The measurement results are output with the `CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult?` command.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Parameters:

<State> ON | OFF

ON
Results output: channel power density in dBm/Hz

OFF
Results output: channel power is displayed in dBm

*RST: OFF

Example: `CALC:MARK:FUNC:POW:RES:PHZ ON`
Output of results referred to the channel bandwidth.
For details on a complete measurement example refer to `CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult?` on page 132.

CALCulate<n>:MARKer<m>:FUNCtion:POWer:SELect <MeasType>

This command selects – and switches on – the specified power measurement type in the window specified by the suffix <n>.

The channel spacings and channel bandwidths are configured in the `SENSe:POWer` subsystem.

Note: If CPOWer is selected, the number of adjacent channels (`[SENSe:]POWer:ACHannel:ACPairs`) is set to 0. If ACPower is selected, the number of adjacent channels is set to 1, unless adjacent-channel power measurement is switched on already.

The channel/adjacent-channel power measurement is performed for the trace selected with `[SENSe:]POWer:TRACe`.

The occupied bandwidth measurement is performed for the trace on which marker 1 is positioned. To select another trace for the measurement, marker 1 is to be positioned on the desired trace by means of `CALCulate<n>:MARKer<m>:TRACe`.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Parameters:

<MeasType> ACPower | CPOWer | MCACpower | OBANdwidth | OBWidth | CN | CNO

ACPower
Adjacent-channel power measurement with a single carrier signal

CPOWer
Channel power measurement with a single carrier signal (equivalent to adjacent-channel power measurement with "NO. OF ADJ CHAN" = 0)

MCACpower
Channel/adjacent-channel power measurement with several carrier signals

OBANdwidth | OBWidth
Measurement of occupied bandwidth

CN
Measurement of carrier-to-noise ratio

CN0
Measurement of carrier-to-noise ratio referenced to 1 Hz bandwidth

Example: `CALC:MARK:FUNC:POW:SEL ACP`
Switches on adjacent-channel power measurement.

4.2.3 Other CALCulate Commands Referenced in this Manual

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4.2.3.1 CALCulate:DELTamarker subsystem

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CALCulate<n>:DELTamarker<m>:MINimum:RIGHt....140
CALCulate<n>:DELTamarker<m>[:STATe]....140
CALCulate<n>:DELTamarker<m>:TRACe....141
CALCulate<n>:DELTamarker<m>:X....141
CALCulate<n>:DELTamarker<m>:X:RELative....141
CALCulate<n>:DELTamarker<m>:Y?....142

CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:X <Reference>

This command defines the horizontal position of the fixed delta marker reference point. The coordinates of the reference may be anywhere in the diagram.

When measuring the phase noise, the command defines the frequency reference for delta marker 2.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Parameters:

<Reference> Numeric value that defines the horizontal position of the reference. For frequency domain measurements, it is a frequency in Hz. For time domain measurements, it is a point in time in s.

*RST: Fixed reference: OFF

Example: `CALC:DELT:FUNC:FIX:RPO:X 128 MHz`
Sets the frequency reference to 128 MHz.

CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:Y <RefPointLevel>

This command defines the vertical position of the fixed delta marker reference point. The coordinates of the reference may be anywhere in the diagram.

When measuring the phase noise, the command defines the level reference for delta marker 2.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Parameters:

<RefPointLevel> Numeric value that defines the vertical position of the reference. The unit and value range is variable.

*RST: Fixed reference: OFF

Example: `CALC:DELT:FUNC:FIX:RPO:Y -10dBm`
Sets the reference point level for delta markers to -10 dBm.

CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed[:STATe] <State>

This command switches the relative measurement to a fixed reference value on or off. Marker 1 is activated previously and a peak search is performed, if necessary. If marker 1 is activated, its position becomes the reference point for the measurement. The reference point can then be modified with the `CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:X` commands and `CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:Y` independently of the position of marker 1 and of a trace. It applies to all delta markers as long as the function is active.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Parameters:

<State> ON | OFF

*RST: OFF

Example: CALC:DELT:FUNC:FIX ON
Switches on the measurement with fixed reference value for all delta markers.
CALC:DELT:FUNC:FIX:RPO:X 128 MHZ
Sets the frequency reference to 128 MHz.
CALC:DELT:FUNC:FIX:RPO:Y 30 DBM
Sets the reference level to +30 dBm.

CALCulate<n>:DELTamarker<m>:FUNCtion:PNOise:AUTO <State>

This command turns an automatic peak search for the fixed reference marker at the end of a sweep on and off.

Suffix:
<n> Selects the measurement window.

<m> irrelevant

Parameters:
<State> ON | OFF
*RST: OFF

Example: CALC:DELT:FUNC:PNO:AUTO ON
Activates an automatic peak search for the reference marker in a phase-noise measurement.

CALCulate<n>:DELTamarker<m>:FUNCtion:PNOise[:STATe] <State>

This command turns the phase noise measurement at the delta marker position on and off.

The correction values for the bandwidth and the log amplifier are taken into account in the measurement.

The reference marker for phase noise measurements is either a normal marker or a fixed reference. If necessary, the command turns on the reference marker

A fixed reference point can be modified with the CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:X and CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:Y commands independent of the position of marker 1 and of a trace.

Suffix:
<n> Selects the measurement window.

<m> irrelevant
Note: marker 2 is always the deltamarker for phase noise measurement results.

Parameters:
<State> ON | OFF
*RST: OFF

Example: CALC:DELT:FUNC:PNO ON
Switches on the phase-noise measurement with all delta markers.
CALC:DELT:FUNC:FIX:RPO:X 128 MHZ
Sets the frequency reference to 128 MHz.
CALC:DELT:FUNC:FIX:RPO:Y 30 DBM
Sets the reference level to +30 dBm

CALCulate<n>:DELTamarker<m>:LINK <State>

This command links delta marker 1 to marker 1.

If you change the horizontal position of the marker, so does the delta marker.

Suffix:
<n> Selects the measurement window.

<m> 1
irrelevant

Parameters:
<State> ON | OFF
*RST: OFF

Example: CALC:DELT:LINK ON

CALCulate<n>:DELTamarker<m>:MAXimum:LEFT

This command positions the delta marker to the next smaller trace maximum on the left of the current value (i.e. descending X values). The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:
<n> Selects the measurement window.

<m> Selects the marker.

Example: CALC:DELT:MAX:LEFT
Sets delta marker 1 to the next smaller maximum value to the left of the current value.

CALCulate<n>:DELTamarker<m>:MAXimum:NEXT

This command positions the delta marker to the next smaller trace maximum. The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:
<n> Selects the measurement window.

<m> Selects the marker.

Example: CALC:DELT2:MAX:NEXT
Sets delta marker 2 to the next smaller maximum value.

CALCulate<n>:DELTamarker<m>:MAXimum[:PEAK]

This command positions the delta marker to the current trace maximum. If necessary, the corresponding delta marker is activated first.

Suffix:
<n> Selects the measurement window.

<m> Selects the marker.

Example: CALC:DELT3:MAX
Sets delta marker 3 to the maximum value of the associated trace.

CALCulate<n>:DELTamarker<m>:MAXimum:RIGHt

This command positions the delta marker to the next smaller trace maximum on the right of the current value (i.e. ascending X values). The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:
<n> Selects the measurement window.

<m> Selects the marker.

Example: CALC:DELT:MAX:RIGH
Sets delta marker 1 to the next smaller maximum value to the right of the current value.

CALCulate<n>:DELTamarker<m>:MINimum:LEFT

This command positions the delta marker to the next higher trace minimum on the left of the current value (i.e. descending X values). The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:
<n> Selects the measurement window.

<m> Selects the marker.

Example: CALC:DELT:MIN:LEFT
Sets delta marker 1 to the next higher minimum to the left of the current value.

CALCulate<n>:DELTamarker<m>:MINimum:NEXT

This command positions the delta marker to the next higher trace minimum. The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Example: `CALC:DELT2:MIN:NEXT`
Sets delta marker 2 to the next higher minimum value.

CALCulate<n>:DELTamarker<m>:MINimum[:PEAK]

This command positions the delta marker to the current trace minimum. The corresponding delta marker is activated first, if necessary.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Example: `CALC:DELT3:MIN`
Sets delta marker 3 to the minimum value of the associated trace.

CALCulate<n>:DELTamarker<m>:MINimum:RIGHt

This command positions the delta marker to the next higher trace minimum on the right of the current value (i.e. ascending X values). The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Example: `CALC:DELT:MIN:RIGH`
Sets delta marker 1 to the next higher minimum value to the right of the current value.

CALCulate<n>:DELTamarker<m>[:STATe] <State>

This command turns delta markers on and off.

If the corresponding marker was a normal marker, it is turned into a delta marker.

No suffix at DELTamarker turns on delta marker 1.

Suffix:
<n> Selects the measurement window.

<m> Selects the marker.

Parameters:
<State> ON | OFF
*RST: OFF

Example: `CALC:DELT1 ON`
Switches marker 1 to delta marker mode.

CALCulate<n>:DELTamarker<m>:TRACe <TraceNumber>

This command selects the trace a delta marker is positioned on.

The corresponding trace must have a trace mode other than "Blank".

Suffix:
<n> Selects the measurement window.

<m> Selects the marker.

Parameters:
<TraceNumber> **1 ... 6**
Trace number the marker is positioned on.

Example: `CALC:DELT3:TRAC 2`
Assigns delta marker 3 to trace 2.

CALCulate<n>:DELTamarker<m>:X <Position>

This command positions a delta marker on a particular coordinate on the x-axis.

The position is an absolute value.

Suffix:
<n> Selects the measurement window.

<m> Selects the marker.

Parameters:
<Position> 0 to maximum frequency or sweep time

Example: `CALC:DELT:X?`
Outputs the absolute frequency/time of delta marker 1.

CALCulate<n>:DELTamarker<m>:X:RELative

This command queries the x-value of the selected delta marker relative to marker 1 or to the reference position (for `CALC:DELT:FUNC:FIX:STAT ON`). The command activates the corresponding delta marker, if necessary.

Suffix:
<n> Selects the measurement window.

<m> Selects the marker.

Example: CALC:DELT3:X:REL?
Outputs the frequency of delta marker 3 relative to marker 1 or relative to the reference position.

CALCulate<n>:DELTamarker<m>:Y?

This command queries the measured value of a delta marker. The corresponding delta marker is activated, if necessary. The output is always a relative value referred to marker 1 or to the reference position (reference fixed active).

To obtain a correct query result, a complete sweep with synchronization to the sweep end must be performed between the activation of the delta marker and the query of the y value. This is only possible in single sweep mode.

Depending on the unit defined with CALC:UNIT:POW or on the activated measuring functions, the query result is output in the units below:

Suffix:
<n> Selects the measurement window.

<m> Selects the marker.

Example: INIT:CONT OFF
Switches to single sweep mode.
INIT;*WAI
Starts a sweep and waits for its end.
CALC:DELT2 ON
Switches on delta marker 2.
CALC:DELT2:Y?
Outputs measurement value of delta marker 2.

Usage: Query only

4.2.3.2 CALCulate:LIMit subsystem

CALCulate<n>:LIMit<k>:ACPower:ACHannel:ABSolute....143
CALCulate<n>:LIMit<k>:ACPower:ACHannel:ABSolute:STATe....143
CALCulate<n>:LIMit<k>:ACPower:ACHannel[:RELative]....144
CALCulate<n>:LIMit<k>:ACPower:ACHannel:RESult....144
CALCulate<n>:LIMit<k>:ACPower:ACHannel[:RELative]:STATe....145
CALCulate<n>:LIMit<k>:ACPower:ALTernate<Channel>:ABSolute....146
CALCulate<n>:LIMit<k>:ACPower:ALTernate<channel>[:RELative]....147
CALCulate<n>:LIMit<k>:ACPower:ALTernate<Channel>[:RELative]:STATe....147
CALCulate<n>:LIMit<k>:ACPower[:STATe]....148
CALCulate<n>:LIMit<k>:FAIL?....148

CALCulate<n>:LIMit<k>:ACPower:ACHannel:ABSolute <LowerLimit>, <UpperLimit>

This command defines the absolute limit value for the lower/upper adjacent channel during adjacent-channel power measurement (Adjacent Channel Power).

Note that the absolute limit value has no effect on the limit check as soon as it is below the relative limit value defined with `CALCulate<n>:LIMit<k>:ACPower:ACHannel[:RELative]`. This mechanism allows automatic checking of the absolute basic values of adjacent-channel power as defined in mobile radio standards.

Suffix:

<n> Selects the measurement window.

<k> irrelevant

Parameters:

<LowerLimit>, <UpperLimit> first value: -200DBM to 200DBM; limit for the lower and the upper adjacent channel

*RST: -200DBM

Example: `CALC:LIM:ACP:ACH:ABS -35DBM, -35DBM`
Sets the absolute limit value for the power in the lower and upper adjacent channel to -35 dBm.

CALCulate<n>:LIMit<k>:ACPower:ACHannel:ABSolute:STATe <State>

This command activates the limit check for the adjacent channel when adjacent-channel power measurement (Adjacent Channel Power) is performed. Before the command, the limit check for the channel/adjacent-channel measurement must be globally switched on using `CALCulate<n>:LIMit<k>:ACPower[:STATe]`.

The result can be queried with `CALCulate<n>:LIMit<k>:ACPower:ACHannel:RESult`. It should be noted that a complete measurement must be performed between switching on the limit check and the result query, since otherwise no correct results are available.

Suffix:

<n> Selects the measurement window.

<k> irrelevant

Parameters:

<State> ON | OFF

*RST: OFF

Example:
```
CALC:LIM:ACP:ACH 30DB, 30DB
```
Sets the relative limit value for the power in the lower and upper adjacent channel to 30 dB below the channel power.
```
CALC:LIM:ACP:ACH:ABS -35DBM, -35DBM
```
Sets the absolute limit value for the power in the lower and upper adjacent channel to -35 dBm.
```
CALC:LIM:ACP ON
```
Switches on globally the limit check for the channel/adjacent-channel measurement.
```
CALC:LIM:ACP:ACH:REL:STAT ON
```
Switches on the check of the relative limit values for adjacent channels.
```
CALC:LIM:ACP:ACH:ABS:STAT ON
```
Switches on the check of absolute limit values for the adjacent channels.
```
INIT;*WAI
```
Starts a new measurement and waits for the sweep end.
```
CALC:LIM:ACP:ACH:RES?
```
Queries the limit check result in the adjacent channels.

CALCulate<n>:LIMit<k>:ACPower:ACHannel[:RELative] <LowerLimit>, <UpperLimit>

This command defines the relative limit of the upper/lower adjacent channel for adjacent-channel power measurements. The reference value for the relative limit value is the measured channel power.

It should be noted that the relative limit value has no effect on the limit check as soon as it is below the absolute limit value defined with the `CALCulate<n>:LIMit<k>:ACPower:ACHannel:ABSolute` command. This mechanism allows automatic checking of the absolute basic values of adjacent-channel power as defined in mobile radio standards.

Suffix:

<n> Selects the measurement window.

<k> irrelevant

Parameters:

<LowerLimit>, <UpperLimit> 0 to 100dB; the value for the lower limit must be lower than the value for the upper limit

*RST: 0 dB

Example:
```
CALC:LIM:ACP:ACH 30DB, 30DB
```
Sets the relative limit value for the power in the lower and upper adjacent channel to 30 dB below the channel power.

CALCulate<n>:LIMit<k>:ACPower:ACHannel:RESult

This command queries the result of the limit check for the upper/lower adjacent channel when adjacent channel power measurement is performed.

If the power measurement of the adjacent channel is switched off, the command produces a query error.

Suffix:
<n> Selects the measurement window.

<k> irrelevant

Return values:
Result The result is returned in the form <result>, <result> where <result> = PASSED | FAILED, and where the first returned value denotes the lower, the second denotes the upper adjacent channel.

Example:
```
CALC:LIM:ACP:ACH 30DB, 30DB
```
Sets the relative limit value for the power in the lower and upper adjacent channel to 30 dB below the channel power.
```
CALC:LIM:ACP:ACH:ABS -35DBM, -35DBM
```
Sets the absolute limit value for the power in the lower and upper adjacent channel to -35 dB.
```
CALC:LIM:ACP ON
```
Switches on globally the limit check for the channel/adjacent channel measurement.
```
CALC:LIM:ACP:ACH:STAT ON
```
Switches on the limit check for the adjacent channels.
```
INIT;*WAI
```
Starts a new measurement and waits for the sweep end.
```
CALC:LIM:ACP:ACH:RES?
```
Queries the limit check result in the adjacent channels.

CALCulate<n>:LIMit<k>:ACPower:ACHannel[:RELative]:STATe <State>

This command activates the limit check for the relative limit value of the adjacent channel when adjacent-channel power measurement is performed. Before this command, the limit check must be activated using `CALCulate<n>:LIMit<k>:ACPower[:STATe]`.

The result can be queried with `CALCulate<n>:LIMit<k>:ACPower:ACHannel:RESult`. Note that a complete measurement must be performed between switching on the limit check and the result query, since otherwise no correct results are available.

Suffix:
<n> Selects the measurement window.

<k> irrelevant

Parameters:
<State> ON | OFF

*RST: OFF

Example:
```
CALC:LIM:ACP:ACH 30DB, 30DB
```
Sets the relative limit value for the power in the lower and upper adjacent channel to 30 dB below the channel power.
```
CALC:LIM:ACP:ACH:ABS -35DBM, -35DBM
```
Sets the absolute limit value for the power in the lower and upper adjacent channel to -35 dBm.
```
CALC:LIM:ACP ON
```
Switches on globally the limit check for the channel/adjacent channel measurement.
```
CALC:LIM:ACP:ACH:STAT ON
```
Switches on the check of the relative limit values for adjacent channels.
```
CALC:LIM:ACP:ACH:ABS:STAT ON
```
Switches on the check of absolute limit values for the adjacent channels.
```
INIT;*WAI
```
Starts a new measurement and waits for the sweep end.
```
CALC:LIM:ACP:ACH:RES?
```
Queries the limit check result in the adjacent channels.

CALCulate<n>:LIMit<k>:ACPower:ALTernate<Channel>:ABSolute <LowerLimit>, <UpperLimit>

This command defines the absolute limit value for the lower/upper alternate adjacent-channel power measurement (Adjacent Channel Power).

Note that the absolute limit value for the limit check has no effect as soon as it is below the relative limit value defined with `CALCulate<n>:LIMit<k>:ACPower:ACHannel[:RELative]`. This mechanism allows automatic checking of the absolute basic values defined in mobile radio standards for the power in adjacent channels.

Suffix:

<n> Selects the measurement window.

<k> irrelevant

<Channel> 1...11
the alternate channel

Parameters:

<LowerLimit>, <UpperLimit> first value: -200DBM to 200DBM; limit for the lower and the upper alternate adjacent channel

*RST: -200DBM

Example:
```
CALC:LIM:ACP:ALT2:ABS -35DBM, -35DBM
```
Sets the absolute limit value for the power in the lower and upper second alternate adjacent channel to -35 dBm.

CALCulate<n>:LIMit<k>:ACPower:ALTernate<channel>[:RELative] <LowerLimit>, <UpperLimit>

This command defines the limit for the alternate adjacent channels for adjacent channel power measurements. The reference value for the relative limit value is the measured channel power.

Note that the relative limit value has no effect on the limit check as soon as it is below the absolute limit defined with `CALCulate<n>:LIMit<k>:ACPower:ALTernate<Channel>:ABSolute`. This mechanism allows automatic checking of the absolute basic values of adjacent-channel power as defined in mobile radio standards.

Suffix:

<n> Selects the measurement window.

<k> irrelevant

<Channel> 1...11
the alternate channel

Parameters:

<LowerLimit>, <UpperLimit> first value: 0 to 100dB; limit for the lower and the upper alternate adjacent channel

*RST: 0 DB

Example:

```
CALC:LIM:ACP:ALT2 30DB, 30DB
```

Sets the relative limit value for the power in the lower and upper second alternate adjacent channel to 30 dB below the channel power.

CALCulate<n>:LIMit<k>:ACPower:ALTernate<Channel>[:RELative]:STATe <State>

This command activates the limit check for the alternate adjacent channels for adjacent channel power measurements. Before the command, the limit check must be activated using `CALCulate<n>:LIMit<k>:ACPower[:STATe]`.

The result can be queried with `CALCulate<n>:LIMit<k>:ACPower:ALTernate<channel>[:RELative]`. Note that a complete measurement must be performed between switching on the limit check and the result query, since otherwise no correct results are obtained.

Suffix:

<n> Selects the measurement window.

<k> irrelevant

<Channel> 1...11
the alternate channel

Parameters:

<State> ON | OFF

*RST: OFF

Example:
`CALC:LIM:ACP:ALT2 30DB, 30DB`
Sets the relative limit value for the power in the lower and upper second alternate adjacent channel to 30 dB below the channel power.
`CALC:LIM:ACP:ALT2:ABS -35DBM, -35DBM`
Sets the absolute limit value for the power in the lower and upper second alternate adjacent channel to -35 dBm.
`CALC:LIM:ACP ON`
Switches on globally the limit check for the channel/adjacent channel measurement.
`CALC:LIM:ACP:ALT2:STAT ON`
Switches on the check of the relative limit values for the lower and upper second alternate adjacent channel.
`CALC:LIM:ACP:ALT2:ABS:STAT ON`
Switches on the check of absolute limit values for the lower and upper second alternate adjacent channel.
`INIT;*WAI`
Starts a new measurement and waits for the sweep end.
`CALC:LIM:ACP:ALT2:RES?`
Queries the limit check result in the second alternate adjacent channels.

CALCulate<n>:LIMit<k>:ACPower[:STATe] <State>

This command switches on and off the limit check for adjacent-channel power measurements. The commands `CALCulate<n>:LIMit<k>:ACPower:ACHannel[:RELative]:STATe` or `CALCulate<n>:LIMit<k>:ACPower:ALTernate<Channel>[:RELative]:STATe` must be used in addition to specify whether the limit check is to be performed for the upper/lower adjacent channel or for the alternate adjacent channels.

Suffix:
<n> Selects the measurement window.

<k> irrelevant

Parameters:
<State> ON | OFF

*RST: OFF

Example:
`CALC:LIM:ACP ON`
Switches on the ACLR limit check.

CALCulate<n>:LIMit<k>:FAIL?

This command queries the result of a limit check.

Note that for SEM measurements, the limit line suffix <k> is irrelevant, as only one specific SEM limit line is checked for the currently relevant power class.

To get a valid result, you have to perform a complete measurement with synchronization to the end of the measurement before reading out the result. This is only possible for single sweeps.

Suffix:
<n> irrelevant

<k> limit line

Return values:
<Result> **0**
PASS
1
FAIL

Example: `INIT;*WAI`
Starts a new sweep and waits for its end.
`CALC:LIM3:FAIL?`
Queries the result of the check for limit line 3.

Usage: Query only

4.2.3.3 CALCulate:LIMit:ESPectrum subsystem

The `CALCulate:LIMit:ESPectrum` subsystem defines the limit check for the Spectrum Emission Mask.

CALCulate<n>:LIMit<k>:ESPectrum:LIMits....149
CALCulate<n>:LIMit<k>:ESPectrum:MODE....150
CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>[:EXCLusive]....150
CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:COUNt....151
CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:LIMit[:STATe]....151
CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:MAXimum....152
CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:MINimum....152
CALCulate<n>:LIMit<k>:ESPectrum:RESTore....152
CALCulate<n>:LIMit<k>:ESPectrum:VALue....153

CALCulate<n>:LIMit<k>:ESPectrum:LIMits <Limits>

This command sets or queries up to 4 power classes in one step.

Suffix:
<n> irrelevant

<k> irrelevant

Parameters:
<Limits> 1–3 numeric values between -200 and 200, separated by commas
-200, <0-3 numeric values between -200 and 200, in ascending order, separated by commas>, 200

Example: `CALC:LIM:ESP:LIM -50,50,70`
Defines the following power classes:
`<-200, -50>`
`<-50, 50>`
`<50, 70>`
`<70, 200>`
Query:
`CALC:LIM:ESP:LIM?`
Response:
`-200,-50,50,70,200`

CALCulate<n>:LIMit<k>:ESPectrum:MODE <Mode>

This command activates or deactivates the automatic selection of the limit line in the Spectrum Emission Mask measurement.

Suffix:
<n> 1...4
window

<k> irrelevant

Parameters:
<Mode> AUTO | MANUAL

AUTO
The limit line depends on the measured channel power.

MANUAL
One of the three specified limit lines is set. The selection is made with the chapter 4.2.3.3, "CALCulate:LIMit:ESPectrum subsystem", on page 149 command.

*RST: AUTO

Example: `CALC:LIM:ESP:MODE AUTO`
Activates automatic selection of the limit line.

CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>[:EXCLusive] <State>

This command sets the power classes used in the spectrum emission mask measurement. It is only possible to use power classes for which limits are defined. Also, either only one power class at a time or all power classes together can be selected.

Suffix:
<n> irrelevant

<k> irrelevant

<Class> 1...4
the power class to be evaluated

Parameters:
<State> ON | OFF

*RST: OFF

Example: `CALC:LIM:ESP:PCL1 ON`
Activates the first defined power class.

CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:COUNt <NoPowerClasses>

This command sets the number of power classes to be defined.

Suffix:
<n> irrelevant

<k> irrelevant

<Class> irrelevant

Parameters:
<NoPowerClasses> 1 to 4
*RST: 1

Example: `CALC:LIM:ESP:PCL:COUN 2`
Two power classes can be defined.

CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:LIMit[:STATe] <State>

This command defines which limits are evaluated in the measurement.

Suffix:
<n> irrelevant

<k> irrelevant

<Class> 1...4
the power class to be evaluated

Parameters:
<State> ABSolute | RELative | AND | OR

ABSolute
Evaluates only limit lines with absolute power values

RELative
Evaluates only limit lines with relative power values

AND
Evaluates limit lines with relative and absolute power values. A negative result is returned if both limits fail.

OR
Evaluates limit lines with relative and absolute power values. A negative result is returned if at least one limit failed.

*RST: REL

Example: `CALC:LIM:ESP:PCL:LIM ABS`

CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:MAXimum <Level>

This command sets the upper limit level for one power class. The unit is dBm. The limit always ends at + 200 dBm, i.e. the upper limit of the last power class can not be set. If more than one power class is in use, the upper limit must equal the lower limit of the next power class.

Suffix:

<n> irrelevant

<k> irrelevant

<Class> 1...4
the power class to be evaluated

Parameters:

<Level> **<numeric value>**
*RST: +200

Example: `CALC:LIM:ESP:PCL1:MAX -40 dBm`
Sets the maximum power value of the first power class to -40 dBm.

CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:MINimum <Level>

This command sets the minimum lower level limit for one power class. The unit is dBm. The limit always start at – 200 dBm, i.e. the first lower limit can not be set. If more than one power class is in use, the lower limit must equal the upper limit of the previous power class.

Suffix:

<n> irrelevant

<k> irrelevant

<Class> 1...4
the power class to be evaluated

Parameters:

<Level> **<numeric_value>**
*RST: -200 for class1, otherwise +200

Example: `CALC:LIM:ESP:PCL2:MIN -40 dBm`
Sets the minimum power value of the second power class to -40 dBm.

CALCulate<n>:LIMit<k>:ESPectrum:RESTore

This command restores the predefined limit lines for the Spectrum Emission Mask

measurement. All modifications made to the predefined limit lines are lost and the factory-set values are restored.

Suffix:
<n> 1...4
window

<k> irrelevant

Example: CALC:LIM:ESP:REST
Resets the limit lines for the Spectrum Emission Mask to the default setting.

CALCulate<n>:LIMit<k>:ESPectrum:VALue <Power>

This command activates the manual limit line selection and specifies the expected power as a value. Depending on the entered value, one of the predefined limit lines is selected.

Suffix:
<n> 1...4
window

<k> irrelevant

Parameters:
<Power> 33 | 28 | 0

33
P ≥ 33

28
28 < P < 33

0
P < 28

*RST: 0

Example: CALC:LIM:ESP:VAL 33
Activates manual selection of the limit line and selects the limit line for P = 33.

4.2.3.4 CALCulate:MARKer subsystem

CALCulate<n>:MARKer<m>:AOFF

This command all markers off, including delta markers and marker measurement functions.

Suffix:
<n> Selects the measurement window.

<m> depends on mode
irrelevant

Example: CALC:MARK:AOFF
Switches off all markers.

Usage: Event

CALCulate<n>:MARKer<m>:MAXimum:LEFT

This command positions a marker to the next smaller trace maximum on the left of the current position (i.e. in descending X values).

If no next smaller maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Example: `CALC:MARK2:MAX:LEFT`
Positions marker 2 to the next lower maximum value to the left of the current value.

Usage: Event

CALCulate<n>:MARKer<m>:MAXimum:NEXT

This command positions the marker to the next smaller trace maximum.

If no next smaller maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Example: `CALC:MARK2:MAX:NEXT`
Positions marker 2 to the next lower maximum value.

Usage: Event

CALCulate<n>:MARKer<m>:MAXimum[:PEAK]

This command positions the marker on the current trace maximum.

The corresponding marker is activated first or switched to the marker mode.

If no maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> Selects the measurement window.

<m> depends on mode
Selects the marker.

Example: `CALC:MARK2:MAX`
Positions marker 2 to the maximum value of the trace.

Usage: Event

CALCulate<n>:MARKer<m>:MAXimum:RIGHt

This command positions a marker to the next smaller trace maximum on the right of the current value (i.e. in ascending X values).

If no next smaller maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Example: `CALC:MARK2:MAX:RIGH`
Positions marker 2 to the next lower maximum value to the right of the current value.

Usage: Event

CALCulate<n>:MARKer<m>:MINimum:LEFT

This command positions a marker to the next higher trace minimum on the left of the current value (i.e. in descending X direction).

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Example: `CALC:MARK2:MIN`
Positions marker 2 to the minimum value of the trace.
`CALC:MARK2:MIN:LEFT`
Positions marker 2 to the next higher minimum value to the left of the current value.

Usage: Event

CALCulate<n>:MARKer<m>:MINimum:NEXT

This command positions ae marker to the next higher trace minimum.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Example: `CALC:MARK2:MIN`
Positions marker 2 to the minimum value of the trace.
`CALC:MARK2:MIN:NEXT`
Positions marker 2 to the next higher maximum value.

Usage: Event

CALCulate<n>:MARKer<m>:MINimum[:PEAK]

This command positions the marker on the current trace minimum.

The corresponding marker is activated first or switched to marker mode, if necessary.

If no minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:
<n> Selects the measurement window.

<m> depends on mode
Selects the marker.

Example: `CALC:MARK2:MIN`
Positions marker 2 to the minimum value of the trace.

Usage: Event

CALCulate<n>:MARKer<m>:MINimum:RIGHt

This command positions a marker to the next higher trace minimum on the right of the current value (i.e. in ascending X direction).

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:
<n> Selects the measurement window.

<m> Selects the marker.

Example: `CALC:MARK2:MIN`
Positions marker 2 to the minimum value of the trace.
`CALC:MARK2:MIN:RIGH`
Positions marker 2 to the next higher minimum value to the right of the current value.

Usage: Event

CALCulate<n>:MARKer<m>[:STATe] <State>

This command turns markers on and off.

If the corresponding marker number is currently active as a deltamarker, it is turned into a normal marker.

Suffix:
<n> Selects the measurement window.

<m> depends on mode
Selects the marker.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:MARK3 ON`

Switches on marker 3 or switches to marker mode.

CALCulate<n>:MARKer<m>:TRACe <Trace>

This command selects the trace a marker is positioned on.

The corresponding trace must have a trace mode other than "Blank".

If necessary, the corresponding marker is switched on prior to the assignment.

Suffix:

<n> Selects the measurement window.

<m> depends on mode
Selects the marker.

Parameters:

<Trace> **1 ... 6**
Trace number the marker is positioned on.

Example: `CALC:MARK3:TRAC 2`

Assigns marker 3 to trace 2.

CALCulate<n>:MARKer<m>:X <Position>

This command positions a marker on a particular coordinate on the x-axis.

If marker 2, 3 or 4 is selected and used as delta marker, it is switched to marker mode.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Parameters:

<Position> Numeric value that defines the marker position on the x-axis. The unit is either Hz (frequency domain) or s (time domain) or dB (statistics).

Range: The range depends on the current x-axis range.

Example: `CALC:MARK2:X 1.7MHz`

Positions marker 2 to frequency 1.7 MHz.

CALCulate<n>:MARKer<m>:X:SLIMits[:STATe] <State>

This command turns marker search limits on and off.

If the power measurement in zero span is active, this command limits the evaluation range on the trace.

Suffix:
<n> Selects the measurement window.

<m> marker

Parameters:
<State> ON | OFF

*RST: OFF

Example: `CALC:MARK:X:SLIM ON`
Switches on search limitation.

CALCulate<n>:MARKer<m>:X:SLIMits:ZOOM <State>

This command sets the limits of the marker search range to the zoom area.

Note: The function is only available if the search limit for marker and delta marker is switched on (see `CALCulate<n>:MARKer<m>:X:SLIMits[:STATe]`).

Suffix:
<n> irrelevant

<m> irrelevant

Parameters:
<State> ON | OFF

*RST: OFF

Example: `CALC:MARK:X:SLIM:ZOOM ON`
Switches the search limit function on.
`CALC:MARK:X:SLIM:RIGH 20MHz`
Sets the right limit of the search range to 20 MHz.

CALCulate<n>:MARKer<m>:Y?

This command queries the measured value of a marker.

The corresponding marker is activated before or switched to marker mode, if necessary.

To get a valid result, you have to perform a complete measurement with synchronization to the end of the measurement before reading out the result. This is only possible for single sweeps.

Suffix:
<n> Selects the measurement window.

<m> Selects the marker.

Return values:
<Result> The measured value of the selected marker is returned.

Example: `INIT:CONT OFF`
Switches to single sweep mode.
`CALC:MARK2 ON`
Switches marker 2.
`INIT;*WAI`
Starts a sweep and waits for the end.
`CALC:MARK2:Y?`
Outputs the measured value of marker 2.

Usage: Query only

CALCulate<n>:MARKer<m>:Y:PERCent <Probability>

This command positions the selected marker to the given probability.

If you use the command in combination with a delta marker, that delta marker is turned into a normal marker.

Note: The command is only available for CCDF measurements. You can query the associated level value with `CALCulate<n>:MARKer<m>:X`.

Suffix:
<n> Selects the measurement window.

<m> Selects the marker.

Parameters:
<Probability> Range: 0 to 100
Default unit: PCT

Example: `CALC1:MARK:Y:PERC 95PCT`
Positions marker 1 to a probability of 95 %.

4.2.3.5 CALCulate:PSE subsystem

CALCulate<n>:PEAKsearch|PSEarch[:IMMediate] 159
CALCulate<n>:PEAKsearch|PSEarch:AUTO 160
CALCulate<n>:PEAKsearch|PSEarch:MARGin 160
CALCulate<n>:PEAKsearch|PSEarch:PSHow 160
CALCulate<n>:PEAKsearch|PSEarch:SUBRanges 160

CALCulate<n>:PEAKsearch|PSEarch[:IMMediate]

This command switches the spurious limit check off.

If you want to read out the values peak values including the delta to a limit, you have to switch on the limit again.

This command is only for FSP compatibility, and not necessary to use on the R&S FSV.

Suffix:
<n> irrelevant

Example: CALC:PSE
Starts to determine the list.

CALCulate<n>:PEAKsearch|PSEarch:AUTO <State>

This command activates or deactivates the list evaluation.

Suffix:
<n> Selects the measurement window.

Parameters:
<State> ON | OFF
*RST: ON

Example: CALC:ESP:PSE:AUTO OFF
Deactivates the list evaluation.

CALCulate<n>:PEAKsearch|PSEarch:MARGin <Margin>

This command sets the margin used for the limit check/peak search.

Suffix:
<n> Selects the measurement window.

Parameters:
<Margin> -200 to 200 dB
*RST: 200 dB

Example: CALC:ESP:PSE:MARG 100
Sets the margin to 100 dB.

CALCulate<n>:PEAKsearch|PSEarch:PSHow

This command marks all peaks with blue squares in the diagram.

Suffix:
<n> Selects the measurement window.

Parameters:
<State> ON | OFF
*RST: OFF

Example: CALC:ESP:PSE:PSH ON
Marks all peaks with blue squares.

CALCulate<n>:PEAKsearch|PSEarch:SUBRanges <NumberPeaks>

This command sets the number of peaks per range that are stored in the list. Once the selected number of peaks has been reached, the peak search is stopped in the current range and continued in the next range.

Suffix:
<n> irrelevant

Parameters:
<NumberPeaks> 1 to 50
*RST: 25

Example: `CALC:PSE:SUBR 10`
Sets 10 peaks per range to be stored in the list.

4.2.3.6 CALCulate:STATistics subsystem

CALCulate<n>:STATistics:CCDF[:STATe] 161
CALCulate<n>:STATistics:NSAMples 161
CALCulate<n>:STATistics:PRESet 162
CALCulate<n>:STATistics:RESult<Trace> 162
CALCulate<n>:STATistics:SCALe:AUTO ONCE 163
CALCulate<n>:STATistics:SCALe:X:RANGe 163
CALCulate<n>:STATistics:SCALe:X:RLEVel 163
CALCulate<n>:STATistics:SCALe:Y:LOWer 164
CALCulate<n>:STATistics:SCALe:Y:UNIT 164
CALCulate<n>:STATistics:SCALe:Y:UPPer 164

CALCulate<n>:STATistics:CCDF[:STATe] <State>

This command switches on or off the measurement of the complementary cumulative distribution function (CCDF). On activating this function, the APD measurement is switched off.

Suffix:
<n> irrelevant

Parameters:
<State> ON | OFF
*RST: OFF

Example: `CALC:STAT:CCDF ON`
Switches on the CCDF measurement.

CALCulate<n>:STATistics:NSAMples <NoMeasPoints>

This command sets the number of measurement points to be acquired for the statistical measurement functions.

Suffix:
<n> irrelevant

Parameters:
<NoMeasPoints> 100 to 1E9
*RST: 100000

Example: `CALC:STAT:NSAM 500`
Sets the number of measurement points to be acquired to 500.

CALCulate<n>:STATistics:PRESet

This command resets the scaling of the X and Y axes in a statistical measurement. The following values are set:

x-axis ref level:	-20 dBm
x-axis range APD:	100 dB
x-axis range CCDF:	20 dB
y-axis upper limit:	1.0
y-axis lower limit:	1E-6

Suffix:
<n> irrelevant

Example: `CALC:STAT:PRES`
Resets the scaling for statistical functions

CALCulate<n>:STATistics:RESult<Trace> <ResultType>

This command reads out the results of statistical measurements of a recorded trace.

Suffix:
<n> irrelevant

<Trace> 1...6
trace

Parameters:
<ResultType> MEAN | PEAK | CFACtor | ALL

MEAN
Average (=RMS) power in dBm measured during the measurement time.

PEAK
Peak power in dBm measured during the measurement time.

CFACtor
Determined CREST factor (= ratio of peak power to average power) in dB.

ALL
Results of all three measurements mentioned before, separated by commas: <mean power>,<peak power>,<crest factor>

The required result is selected via the following parameters:

Example: CALC:STAT:RES2? ALL
Reads out the three measurement results of trace 2. Example of answer string: 5.56,19.25,13.69 i.e. mean power: 5.56 dBm, peak power 19.25 dBm, CREST factor 13.69 dB

CALCulate<n>:STATistics:SCALe:AUTO ONCE

This command optimizes the level setting of the instrument depending on the measured peak power, in order to obtain maximum instrument sensitivity.

To obtain maximum resolution, the level range is set as a function of the measured spacing between peak power and the minimum power for the APD measurement and of the spacing between peak power and mean power for the CCDF measurement. In addition, the probability scale for the number of test points is adapted.

Subsequent commands have to be synchronized with *WAI, *OPC or *OPC? to the end of the auto range process which would otherwise be aborted.

Suffix:
<n> irrelevant

Example: CALC:STAT:SCAL:AUTO ONCE;*WAI
Adapts the level setting for statistical measurements.

CALCulate<n>:STATistics:SCALe:X:RANGe <Value>

This command defines the level range for the x-axis of the measurement diagram. The setting is identical to the level range setting defined with the DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe] command.

Suffix:
<n> irrelevant

Parameters:
<Value> 10dB to 200dB
*RST: 100dB

Example: CALC:STAT:SCAL:X:RANG 20dB

CALCulate<n>:STATistics:SCALe:X:RLEVel <Value>

This command defines the reference level for the x-axis of the measurement diagram. The setting is identical to the reference level setting using the DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel command.

With the reference level offset <> 0 the indicated value range of the reference level is modified by the offset.

The unit depends on the setting performed with CALCulate<n>:UNIT:POWer.

Suffix:
<n> irrelevant

Parameters:
<Value> -120dBm to 20dBm
*RST: -20dBm

Example: `CALC:STAT:SCAL:X:RLEV -60dBm`

CALCulate<n>:STATistics:SCALe:Y:LOWer <Value>

This command defines the lower limit for the y-axis of the diagram in statistical measurements. Since probabilities are specified on the y-axis, the entered numeric values are dimensionless.

Suffix:
<n> selects the screen

Parameters:
<Value> 1E-9 to 0.1
*RST: 1E-6

Example: `CALC:STAT:SCAL:Y:LOW 0.001`

CALCulate<n>:STATistics:SCALe:Y:UNIT <Unit>

This command defines the scaling type of the y-axis.

Suffix:
<n> selects the screen

Parameters:
<Unit> PCT | ABS
*RST: ABS

Example: `CALC:STAT:SCAL:Y:UNIT PCT`
Sets the percentage scale.

CALCulate<n>:STATistics:SCALe:Y:UPPer <Value>

This command defines the upper limit for the y-axis of the diagram in statistical measurements. Since probabilities are specified on the y-axis, the entered numeric values are dimensionless.

Suffix:
<n> irrelevant

Parameters:
<Value> 1E-8 to 1.0
*RST: 1.0

Example: `CALC:STAT:SCAL:Y:UPP 0.01`

4.2.3.7 Other Referenced CALCulate Commands

CALCulate<n>:THReshold....165
CALCulate<n>:UNIT:POWer....165

CALCulate<n>:THReshold <Threshold>

This command defines a threshold value for the marker peak search.

A threshold line is automatically turned on.

Suffix:
<n> irrelevant

Parameters:
<Threshold> The unit depends on `CALCulate<n>:UNIT:POWer`.

*RST: (STATe to OFF)

Example: `CALC:THR -82DBM`
Sets the threshold value to -82 dBm.

CALCulate<n>:UNIT:POWer <Unit>

This command selects the unit of the y-axis.

The unit applies to all measurement windows.

Suffix:
<n> irrelevant

Parameters:
<Unit> DBM | V | A | W | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMPere

*RST: dBm

Example: `CALC:UNIT:POW DBM`
Sets the power unit to dBm.

4.3 CONFigure Subsystem

The following commands configure code domain measurements.

CONFigure:CDPower[:BTS]:CTABle[:STATe] <State>

This command activates or deactivates the 'RECENT' channel table. To select another channel table, use the CONFigure:CDPower[:BTS]:CTABle:SELect command.

Parameters:
<State> **ON | OFF**

*RST: OFF

Example: `CONF:CDP:CTAB ON`
Activates the 'RECENT' channel table.

Mode: CDMA, EVDO, TDS, WCDMA

CONFigure:CDPower[:BTS]:CTABle:CATalog?

This command queries the names of all the channel tables stored on the flash disk for the current operating mode.

The syntax for the return values is: <sum of file lengths of all files>, <free disk space>, <1st file name>, <1st file length>, <2nd file name>, <2nd file length>,...,<nth file name>, <nth file length>

Example: `CONF:CDP:CTAB:CAT?`
Returns all existing channel tables.

Usage: Query only

Mode: CDMA, EVDO, TDS, WCDMA

CONFigure:CDPower[:BTS]:CTABle:COMMent <Comment>

This command defines a comment for the channel table selected with CONFigure:CDPower[:BTS]:CTABle:NAME.

Parameters:
<Comment> comment for the channel table

Example: `CONF:CDP:CTAB:NAME 'CTAB_1'`
Selects channel table 'CTAB_1'.
`CONF:CDP:CTAB:COMM 'Comment for CTAB_1'`
Writes a comment for 'CTAB_1'.

Mode: CDMA, EVDO, TDS, WCDMA

CONFigure:CDPower[:BTS]:CTABle:COPY <TargetFileName>

This command copies one channel table to another. Select the channel table you want to copy using the `CONFigure:CDPower[:BTS]:CTABle:NAME` command. The name of the channel table may contain up to eight characters.

Parameters:
<TargetFileName> <string> = name of the new channel table

Example: `CONF:CDP:CTAB:NAME 'CTAB_1'`
Selects channel table 'CTAB_1'.
`CONF:CDP:CTAB:COPY 'CTAB_2'`
Makes a copy of 'CTAB_1' with the name 'CTAB_2'.

Mode: CDMA, EVDO, TDS, WCDMA

CONFigure:CDPower[:BTS]:CTABle:DATA <numeric values>

This command sets the parameters of the channel table selected or created with the CONFigure:CDPower[:BTS]:CTABle:NAME command.

Parameters:

<numeric values> To define a channel (one row in the channel table), you have to enter eight values in the following order:
<channel type>, <code class>, <code number>, <modulation type>, <midamble shift>, <status>, <reserved 1>, <reserved 2>, ...

<channel type>
The channel type is coded with numbers:
1 = Midamble
2 = DPCH
3 = P-CCPCH
4 = S-CCPCH
5 = FPACH
6 = PRACH
7 = PICH

<code class>
0...4

<code number>
0...[spreading factor-1]

<modulation type>
0 = invalid (for midamble)
1 = QPSK
2 = 8PSK
3 = 16QAM
4 = 64QAM

<midamble shift>
1...16

<status>
0 = inactive
1 = active

<reserved 1>
always 0 (reserved)

<reserved 2>
always 0 (reserved)

*RST: RST value

Example:
```
CONF:CDP:CTAB:NAME 'CTAB_1'
```
Selects or creates channel table 'CTAB_1'
```
CONF:CDP:CTAB:DATA
'2,4,1,1,1,1,0,0,2,4,2,1,1,1,0,0'
```
Defines two data channels with QPSK modulation.

Mode: TDS

CONFigure:CDPower[:BTS]:CTABle:DELete

This command deletes the selected channel table. Select the channel table you want to delete using the `CONFigure:CDPower[:BTS]:CTABle:NAME` command.

Example: `CONF:CDP:CTAB:NAME 'CTAB_1'`
Selects channel table 'CTAB_1'
`CONF:CDP:CTAB:DEL '2,4,1,1,1,1,0,0,2,4,2,1,1,1,0,0'`
Deletes channel table 'CTAB_1'.

Mode: CDMA, EVDO, TDS, WCDMA

CONFigure:CDPower[:BTS]:CTABle:MSHift <numeric value>

This command sets the maximum number of midamble shifts in the channel table.

Parameters:
<numeric value> **2 | 4 | 6 | 8 | 10 | 12 | 14 | 16**
*RST: 16

Example: `CONF:CDP:CTAB:NAME 'CTAB_1'`
Selects channel table 'CTAB_1'
`CONF:CDP:CTAB:MSH 4`
Sets the maximum number of midamble shifts to 4.

Mode: TDS

CONFigure:CDPower[:BTS]:CTABle:NAME <ChannelTable>

This command selects an existing channel table or creates a new one. Use this command to edit the channel table. To use a channel table for a measurement, use the CONFigure:CDPower[:BTS]:CTABle:SELect command.

Parameters:
<ChannelTable> <string> = name of the channel table

Example: `CONF:CDP:CTAB:NAME 'NEW_TAB'`
Selects channel table for editing. If a channel table with this name does not exist, a new channel table by that name is created.

Mode: CDMA, EVDO, TDS, WCDMA

CONFigure:CDPower[:BTS]:CTABle:ORDer <CODE | MIDamble>

This command selects sorting of the channel table in code order or midamble order.

Parameters:

<CODE | MIDamble> **CODE**
Channels are sorted in code order.

MIDamble
Channels are sorted in midamble order.

*RST: CODE

Example: `CONF:CDP:CTAB:ORD`
Sorts the channels in code order.

Mode: TDS

CONFigure:CDPower[:BTS]:CTABle:RESTore

This command restores the predefined channel tables to their factory-set values. In this way, you can undo unintentional overwriting.

Example: `CONF:CDP:CTAB:REST`
Restores the predefined channel tables.

Usage: Event

Mode: CDMA, EVDO, TDS

CONFigure:CDPower[:BTS]:CTABle:SELect <ChannelTable>

This command selects the channel table for a measurement. In order to activate a predefined channel table with this command, you have to activate the RECENT channel table with the `CONFigure:CDPower[BTS]:CTABle[:STATe]` command first.

Parameters:

<ChannelTable> <string> = name of the channel table.

*RST: RECENT

Example: `CONF:CDP:CTAB:SEL 'CTAB_1'`
Selects the channel table 'CTAB_1'

Mode: CDMA, EVDO, TDS, WCDMA

CONFigure:CDPower[:BTS]:MEASurement <measurement>

This command selects the measurements of the TD-SCDMA BTS and UE Measurement Application.

Parameters:

<measurement>

ACLR
Adjacent Channel Power

CCDF
Complementary Cumulative Distribution Function

CDPower
Code Domain Power

ESPectrum
Spectrum Emission Mask

OBWidth
Occupied Bandwidth

POWer
Channel Power

PVTime
Power vs Time

*RST: CDPower

Example: `CONF:CDP:MEAS POW`
Selects Signal Channel Power measurement.

Mode: TDS

CONFigure:CDPower[:BTS]:PVTime:SFRames <numeric value>

This command defines the number of subframes to be used for averaging.

Parameters:

<numeric value> Subframe value.

*RST: 100

Example: `CONF:CDP:PVT:SFR 50`
Sets the number of subframes to 50.

Mode: TDS

CONFigure:CDPower[:BTS]:PVTime:SPOint <numeric value>

This command sets the switching point between uplink and downlink slots.

Parameters:

<numeric value> 1 to 7

*RST: 3

Example: `CONF:CDP:PVT:SPO 7`
Sets the switching point to 7.

Mode: TDS

4.4 DISPlay Subsystem

This chapter describes the remote control commands of the DISPlay subsystem that are specific to the measurement application.

DISPlay[:WINDow<n>]:SIZE <Size>

This command controls the size of the specified measurement window. The result display of the screen is, by default, the same as that of the first measurement screen.

Suffix:
<n> 1...4
window

Parameters:
<Size> **LARGe**
Enlargens the measurement window to full size.

SMALl
Turns the measurement window back to its default size.

*RST: SMALl

Example: `DISP:WIND2:SIZE LARG`
Maximizes measurement window 2.

Mode: CDMA, EVDO, TDS

DISPlay[:WINDow<n>]:SSELect

This command controls which of the measurement windows is active. Select the measurement window via the numeric suffix.

Suffix:
<n> 1...4
window

Example: `DISP:WIND2:SSEL`
Maximizes measurement window 2.

Mode: CDMA, EVDO, TDS, WCDMA

DISPlay[:WINDow<n>]:STATe <State>

Activates/deactivates the window specified by the suffix <n>. The other measurements are not aborted but continue running in the background:

Suffix:
<n> window

Parameters:
<State> ON | OFF

*RST: OFF

Example: DISP:WIND3:STAT ON
Turns on a third measurement screen.

Mode: CDMA, EVDO, TDS, WCDMA

DISPlay[:WINDow<n>]:TRACe<t>:MODE <Mode>

This command defines the type of display and the evaluation of the traces. WRITE corresponds to the Clr/Write mode of manual operation. The trace is switched off (= BLANK in manual operation) with DISPlay[:WINDow<n>]:TRACe<t>[:STATe].

The number of measurements for AVERage, MAXHold and MINHold is defined with the [SENSe:]AVERage<n>:COUNt or [SENSe:]SWEep:COUNt commands. It should be noted that synchronization to the end of the indicated number of measurements is only possible in single sweep mode.

Suffix:
<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<t> trace

Parameters:
<Mode> WRITe | VIEW | AVERage | MAXHold | MINHold | BLANk

*RST: WRITe for TRACe1, STATe OFF for TRACe2/3/4/5/6
For details on trace modes refer to chapter 3.3.2, "Trace Mode Overview", on page 105.

Example: INIT:CONT OFF
Switching to single sweep mode.
SWE:COUN 16
Sets the number of measurements to 16.
DISP:TRAC3:MODE MAXH
Switches on the calculation of the maximum peak for trace 3.
INIT;*WAI
Starts the measurement and waits for the end of the 16 sweeps.

DISPlay[:WINDow<n>]:TRACe<t>[:STATe] <State>

This command switches on or off the display of the corresponding trace. The other measurements are not aborted but continue running in the background.

Suffix:
<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<t> trace

Parameters:
<State> ON | OFF

*RST: ON for TRACe1, OFF for TRACe2 to 6

Example: DISP:TRAC3 ON

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe] <Range>

This command defines the display range of the y-axis with logarithmic scaling.

The command works only for a logarithmic scaling. You can select the scaling with `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 176.

Suffix:
<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<t> irrelevant

Parameters:
<Range> Range: 10 to 200
*RST: 100
Default unit: dB

Example: `DISP:TRAC:Y 110dB`

DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:AUTO <ONCE>

This command automatically scales the y-axis in order to get the best display result for the active trace.

Suffix:
<n> 1...4
window

Parameters:
<ONCE> *RST: OFF

Example: `DISP:WIND2:TRAC:Y:AUTO`
Adjusts the y-axis of measurement window 2.

Mode: CDMA, EVDO, TDS

DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:MAXimum <numeric value>

This command defines the upper limit of the y-axis in the indicated measurement window.

Suffix:
<n> 1...4
window

Parameters:
<numeric value> The unit and range depend on the result display.
*RST: depends on the result display

Example:
```
DISP:TRAC:Y:MIN -60 DBM
DISP:TRAC:Y:MAX 0 DBM
```
Defines a y-axis with a minimum value of -60 dBm and a maximum value of 0 dBm.

Mode: CDMA, EVDO, TDS

DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:MINimum <numeric value>

This command defines the lower limit of the y-axis in the indicated measurement window.

Suffix:
<n> 1...4
window

Parameters:
<numeric value> The unit and range depend on the result display.
*RST: depends on the result display

Example:
```
DISP:TRAC:Y:MIN -60 DBM
DISP:TRAC:Y:MAX 0 DBM
```
Defines a y-axis with a minimum value of -60 dBm and a maximum value of 0 dBm.

Mode: CDMA, EVDO, TDS

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:MODE <Mode>

This command selects the type of scaling of the y-axis.

When `SYSTem:DISPlay:UPDate` is turned off, this command has no immediate effect on the screen.

Suffix:
<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<t> irrelevant

Parameters:
<Mode> **ABSolute**
absolute scaling of the y-axis
RELative
relative scaling of the y-axis
*RST: ABS

Example:
```
DISP:TRAC:Y:MODE REL
```

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:PDIVision <Value>

This remote command determines the grid spacing on the Y axis for all diagrams, where possible.

Suffix:
<n> irrelevant

<t> irrelevant

Parameters:
<Value> numeric value; the unit depends on the result display
*RST: depends on the result display

Example: `DISP:TRAC:Y:PDIV 10`
Sets the grid spacing to 10 units (for example 10 dB in the Code Domain Power result display).

Mode: CDMA, BT, EVDO, TDS, WCDMA

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel <ReferenceLevel>

This command defines the reference level.

With the reference level offset ≠ 0, the value range of the reference level is modified by the offset.

Suffix:
<n> irrelevant.

<t> irrelevant

Parameters:
<ReferenceLevel> The unit is variable.

Range: see datasheet
*RST: -10dBm

Example: `DISP:TRAC:Y:RLEV -60dBm`

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet <Value>

This command defines a reference level offset.

Suffix:
<n> irrelevant.

<t> irrelevant

Parameters:
<Value> Range: -200 to 200
*RST: 0
Default unit: dB

Example: `DISP:TRAC:Y:RLEV:OFFS -10dB`

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RPOSition <Position>

This command defines the position of the reference level on the display grid..

When using a tracking generator (only with option R&S FSV-B9 or -B10, requires active normalization), and in Bluetooth mode (option R&S FSV-K8) this command defines the position of the reference value for all windows.

Suffix:
<n> Selects the measurement window.

<t> irrelevant

Parameters:

<Position> 0 PCT corresponds to the lower display border, 100% corresponds to the upper display border.

Range: 0 to 100
*RST: Spectrum mode: 100 PCT, with tracking generator or time display: 50 PCT
Default unit: PCT

Example:
```
DISP:TRAC:Y:RPOS 50PCT
```

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RVALue <Value>

The command defines the power value assigned to the reference position in the grid.

When using a tracking generator, this command requires active normalization.

Suffix:

<n> irrelevant

<t> irrelevant

Parameters:

<Value> *RST: 0 dB, coupled to reference level

Example:
```
DISP:TRAC:Y:RVAL -20dBm
```
Defines a reference position of -20 dBm.

DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing <ScalingType>

This command selects the scaling of the y-axis.

Suffix:

<n> Selects the measurement window.

<t> irrelevant

Parameters:

<ScalingType>

LOGarithmic
Logarithmic scaling.

LINear
Linear scaling in %.

LDB
Linear scaling in dB.

*RST: LOGarithmic

Example:
```
DISP:TRAC:Y:SPAC LIN
```
Select a linear scale.

4.5 INSTrument subsystem

The INSTrument subsystem selects the operating mode of the unit either via text parameters or fixed numbers.

INSTrument[:SELect] 177
INSTrument:NSELect 177

INSTrument[:SELect] <Mode>

This command switches between the measurement modes by means of text parameters.

Parameters:

<Mode>

BTDS
TDS BTS mode (R&S FSV-K76 option)

MTDS
TD-SCDMA UE mode (R&S FSV-K77 option)

INSTrument:NSELect <Mode>

This command switches between the measurement modes by means of numbers.

Parameters:

<Mode>

17
TDS BTS mode (R&S FSV-K76 option)

18
TD-SCDMA UE mode (R&S FSV-K77 option)

4.6 SENSe Subsystem

This chapter describes the remote control commands of the SENSe subsystem that are specific to the measurement application.

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4.6.1 SENSe:CDPower Commands

The SENSe:CDPower subsystem configures the code domain measurements.

[SENSe:]CDPower:CODE <CodeNo>

This command selects the code number.

Parameters:

<CodeNo> <numeric value>

Range: 1 to 16 (depends on the base spreading factor)
Increment: 1
*RST: 1

Example: `CDP:CODE 8`
Selects the eighth channel.

Mode: TDS

[SENSe:]CDPower:ICThreshold <ThresholdLevel>

This command defines the minimum power that a single channel must have compared to the total signal in order to be regarded as an active channel. Channels below the specified threshold are regarded as "inactive".

Parameters:

<ThresholdLevel> Range: -100 dB to 0 dB
*RST: -60 dB

Example: `CDP:ICT -50`
Sets the Inactice Channel Threshold to -50 dB.

Mode: CDMA, EVDO, TDS, WCDMA

[SENSe:]CDPower:IQLength <CaptureLength>

This command specifies the number of frames/slots that are captured by one sweep.

In CDMA mode, this command sets the capture length in multiples of the power control group.

Parameters:

<CaptureLength> Range: 2 to 63
*RST: 7

Example: `SENS:CDP:IQLength 3`

Mode: TDS

[SENSe:]CDPower:LEVel:ADJust

This command adjusts the reference level to the measured channel power. This ensures that the settings of the RF attenuation and the reference level are optimally adjusted to the signal level without overloading the R&S FSV or limiting the dynamic range by an S/N ratio that is too small.

Example: `CDP:LEV:ADJ`
Adjusts the reference level.

Mode: CDMA, EVDO, TDS, WCDMA

[SENSe:]CDPower:MMAX <ModType>

This command defines the highest modulation to be considered in the automatic channel search. In low SNR environments it may be necessary to limit the channel search to lower modulations than 64QAM.

Parameters:

<ModType>

QPSK
Consider QPSK modulation only

PSK8
Consider QPSK and 8PSK modulation.

QAM16
Consider QPSK, 8PSK and 16QAM modulation

QAM64
Consider QPSK, 8PSK, 16QAM and 64QAM modulation

*RST: QAM64

Example: `SENS:CDP:MMAX PSK8`
assume QPSK and 8PSK modulations only for the automatic channel search

Mode: TDS

[SENSe:]CDPower:MSHift <numeric value>

This command sets the maximum number of midamble shifts.

Parameters:

<numeric value>

Range: 2 to 16
Increment: 2
*RST: 16

Example: `CDP:MSH 10`
Sets the maximum number of midamble shifts to 10.

Mode: TDS

[SENSe:]CDPower:NORMalize <boolean>

This command activates or deactivates the elimination of the IQ offset from the signal.

Parameters:
<ON | OFF> *RST: OFF

Example: `CDP:NORM ON`
Activates normalization.

Mode: CDMA, EVDO, TDS, WCDMA

[SENSe:]CDPower:QINVert <State>

This command inverts the Q component of the signal.

Parameters:
ON | OFF *RST: OFF

Example: `CDP:QINV ON`
Activates inversion of Q component.

Mode: CDMA, EVDO, TDS, WCDMA

[SENSe:]CDPower:SBANd <NORMal | INVers>

This command is used to swap the left and right sideband.

Parameters:
<NORMal | INVers> *RST: NORM

Example: `CDP:SBAN INV`
Switches the right and left sideband.

Mode: CDMA, EVDO, TDS

[SENSe:]CDPower:SCODe <numeric value>

This command sets the scrambling code of the base station.

Parameters:
<numeric value> Range: 0 to 127
Increment: 1
*RST: 0

Example: `CDP:SCOD 28`
Sets scrambling code 28.

Mode: TDS

[SENSe:]CDPower:SET <SetNo>

This command selects a specific set for further analysis. The number of sets has to be defined with the `[SENSe:]CDPower:SET` command before using this command.

Parameters:

<SetNo>
Range: 0 to SET COUNT -1
Increment: 1
*RST: 0

Example: `CDP:SET:COUN 10`
Selects the 10th set for further analysis.

Mode: CDMA, EVDO, TDS

[SENSe:]CDPower:SET:COUNt <NoOfSets>

This command sets the number of sets to be captured and stored in the instrument's memory.

Refer to "Set Count" on page 20 for more information.

Parameters:

<NoOfSets>
Range: 1 to TDS: 99; CDMA: 490
Increment: 1
*RST: 1

Example: `CDP:SET:COUN 12`
Sets the number of sets to 12.

Mode: TDS

[SENSe:]CDPower:SLOT <numeric value>

This command selects the slot/Power Control Group (PCG) to be analyzed.

Parameters:

<numeric value>
Range: 0 to TDS: 62; CDMA: (capture length-1); WCDMA. 14
Increment: 1
*RST: 0
The capture length is defined via the `[SENSe:]CDPower:IQLength` command.

Example: `CDP:SLOT 7`
Selects slot number 7 for analysis.

Mode: CDMA, EVDO, TDS, WCDMA

[SENSe:]CDPower:STSLot <State>

This command selects the phase reference for forward link measurements (see "Sync To (forward link, K76)" on page 22).

Parameters:

<State> ON | OFF

ON
The instrument synchronizes to the midamble of the selected slot.

OFF
The instrument synchronizes to the P-CCPCH in slot 0.

*RST: OFF

Example: `CDP:SLOT 7`
Selects slot number 7.
`CDP:STSL ON`
Activates synchronizing to the midamble of slot 7.

Mode: TDS

[SENSe:]CDPower:STSLot:MODE <Mode>

This command selects the phase reference for downlink measurements (see "Sync To (downlink, K77)" on page 23).

Parameters:

<Mode> CODE | MA

CODE
The instrument synchronizes to the code channel of the selected slot.

MA
The instrument synchronizes to the midamble of the selected slot.

*RST: MA

Example: `CDP:STSL:MODE CODE`
Activates code channel synchronizing

Mode: TDS

[SENSe:]CDPower:STSLot:ROTate <Mode>

By default, the R&S FSV-K76/77 determines one phase reference for all midambles and code channels of a data slot. If this command is activated, phase rotations between the code channels are allowed. Each code channel gets its own phase reference from the associated midamble according to section AA.2 of the standard document 3GPP TS 25.221. If the associated midamble is missing, the common phase reference is used for this code channel.

Parameters:

<Mode> ON | OFF

*RST: OFF

Example: `CDP:STSL:ROT ON`
Allows phase rotations between code channels.

Mode: TDS

[SENSe:]POWer:ACHannel:AUTO:LTIMe

Starts the autorange routine for the reference level. This also creates the relationship between trigger and subframe start.

Note that subsequent commands have to be synchronized with *WAI, *OPC or *OPC? to the end of the autorange process which would otherwise be aborted.

Example: `POW:ACH:AUTO:LTIM;*WAI`
Starts the autorange and timing routine.

Usage: Event

Mode: TDS

4.6.2 SENSe:POWer Commands

The SENSe:POWer subsystem configures the RF Power measurement.

[SENSe:]POWer:ACHannel:AUTO:LTIMe....183
[SENSe:]POWer:ACHannel:SLOT:STarT....183
[SENSe:]POWer:ACHannel:SLOT:STOP....183

[SENSe:]POWer:ACHannel:AUTO:LTIMe

This command automatically adjusts the reference level and the trigger to frame time to their optimum levels. This prevents overloading of the R&S FSV.

Current measurements are aborted when this command is executed and resumed after the automatic level detection is finished.

Usage: Event

Mode: TDS

[SENSe:]POWer:ACHannel:SLOT:STarT <StopSlot>

Sets the first slot of the measurement.

Parameters:
<StartSlot> The start slot may not be larger than the stop slot.
Range: 1 to 7
*RST: 4 (BTS); 1 (MS)

Example: `POW:ACH:SLOT:STAR 2`

Mode: TDS

[SENSe:]POWer:ACHannel:SLOT:STOP <StopSlot>

Sets the last slot of the measurement.

Parameters:

<StopSlot> The stop slot may not be lower than the start slot.
In MS mode, stop slots other than 1 require an external trigger.

Range: 1 to 7
*RST: 6 (BTS); 1 (MS)

Example: `POW:ACH:SLOT:STOP 5`

Mode: TDS

4.6.3 Other SENSe Commands Referenced in this Manual

4.6.3.1 SENSe:ADJust Subsystem

[SENSe:]ADJust:ALL....184
[SENSe:]ADJust:CONFiguration:HYSTeresis:LOWer....184
[SENSe:]ADJust:CONFiguration:HYSTeresis:UPPer....184
[SENSe:]ADJust:CONFigure:LEVel:DURation....185
[SENSe:]ADJust:CONFigure:LEVel:DURation:MODE....185
[SENSe:]ADJust:FREQuency....185
[SENSe:]ADJust:LEVel....186

[SENSe:]ADJust:ALL

This command determines the ideal frequency and level configuration for the current measurement.

Example: `ADJ:ALL`

[SENSe:]ADJust:CONFiguration:HYSTeresis:LOWer <Threshold>

This command defines a lower threshold the signal must drop below before the reference level is automatically adjusted when the "Auto Level" function is performed.

For more information see `[SENSe:]ADJust:LEVel`).

Parameters:

<Threshold> Range: 0 to 200
*RST: +1 dB
Default unit: dB

Example: `SENS:ADJ:CONF:HYST:LOW 2`

Example: For an input signal level of currently 20 dBm, the reference level will only be adjusted when the signal level falls below 18 dBm.

[SENSe:]ADJust:CONFiguration:HYSTeresis:UPPer <Threshold>

This command defines an upper threshold the signal must exceed before the reference level is automatically adjusted when the "Auto Level" function is performed.

For more information see [SENSe:]ADJust:LEVel).

Parameters:

<Threshold>
Range: 0 to 200
*RST: +1 dB
Default unit: dB

Example: SENS:ADJ:CONF:HYST:UPP 2
For an input signal level of currently 20 dBm, the reference level will only be adjusted when the signal level rises above 22 dBm.

[SENSe:]ADJust:CONFigure:LEVel:DURation <Duration>

This command defines the duration of the level measurement used to determine the optimal reference level automatically (for SENS:ADJ:LEV ON).

Parameters:

<Duration>
<numeric value> in seconds
Range: 0.001 to 16000.0
*RST: 0.001
Default unit: s

Example: ADJ:CONF:LEV:DUR:5

[SENSe:]ADJust:CONFigure:LEVel:DURation:MODE <Mode>

This command selects the way the R&S FSV determines the length of the measurement that is performed while determining the ideal reference level.

Parameters:

<Mode>
AUTO
Automatically determines the measurement length.
MANual
Manual definition of the measurement length.
*RST: AUTO

Example: ADJ:CONF:LEV:DUR:MODE MAN
Specifies manual definition of the measurement duration.
ADJ:CONF:LEV:DUR:5
Specifies the duration manually.

[SENSe:]ADJust:FREQuency

This command defines the center frequency automatically by determining the highest level in the frequency span.

Example: ADJ:FREQ

[SENSe:]ADJust:LEVel

This command automatically sets the optimal reference level for the current measurement.

You can define a threshold that the signal must exceed before the reference level is adjusted, see `[SENSe:]ADJust:CONFiguration:HYSTeresis:UPPer` and `[SENSe:]ADJust:CONFiguration:HYSTeresis:LOWer`.

Example: `ADJ:LEV`

4.6.3.2 SENSe:ESPectrum Subsystem

The `SENSe:ESPectrum` subsystem contains the remote commands to configure Spectrum Emission Mask (SEM) measurements.

[SENSe:]ESPectrum:BWID....186
[SENSe:]ESPectrum:FILTer[:RRC][:STATe]....187
[SENSe:]ESPectrum:FILTer[:RRC]:ALPHa....187
[SENSe:]ESPectrum:HighSPeed....187
[SENSe:]ESPectrum:PRESet[:STANdard]....188
[SENSe:]ESPectrum:PRESet:RESTore....188
[SENSe:]ESPectrum:PRESet:STORe....189
[SENSe:]ESPectrum:RANGe<range>:BANDwidth[:RESolution]....189
[SENSe:]ESPectrum:RANGe<range>:BANDwidth:VIDeo....189
[SENSe:]ESPectrum:RANGe<range>:COUNt....189
[SENSe:]ESPectrum:RANGe<range>:DELete....190
[SENSe:]ESPectrum:RANGe<range>:FILTer:TYPE....190
[SENSe:]ESPectrum:RANGe<range>[:FREQuency]:STARt....190
[SENSe:]ESPectrum:RANGe<range>[:FREQuency]:STOP....191
[SENSe:]ESPectrum:RANGe<range>:INPut:ATTenuation....191
[SENSe:]ESPectrum:RANGe<range>:INPut:ATTenuation:AUTO....192
[SENSe:]ESPectrum:RANGe<range>:INPut:GAIN:STATe....192
[SENSe:]ESPectrum:RANGe<range>:INSert....192
[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:ABSolute:STARt....193
[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:ABSolute:STOP....193
[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:RELative:STARt....193
[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:RELative:STOP....194
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[SENSe:]ESPectrum:RANGe<range>:RLEVel....195
[SENSe:]ESPectrum:RANGe<range>:SWEep:TIME....195
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[SENSe:]ESPectrum:RANGe<range>:TRANsducer....196
[SENSe:]ESPectrum:RRANge....196
[SENSe:]ESPectrum:RTYPe....196

[SENSe:]ESPectrum:BWID <Bandwidth>

This command defines the bandwidth used for measuring the channel power (reference range). This setting takes only effect if channel power is selected as power reference type (see `[SENSe:]ESPectrum:RTYPe` on page 196).

Parameters:

<Bandwidth> minimum span ≤ value ≤ span of reference range

*RST: 3.84 MHz

Example: `ESP:RTYP CPOW`
Sets the power reference type to channel power.
`ESP:BWID 1 MHZ`
Sets the Tx bandwidth to 1 MHz.

[SENSe:]ESPectrum:FILTer[:RRC][:STATe] <State>

This command activates or deactivates the use of an RRC filter. This setting only takes effect if channel power is selected as power reference type (see `[SENSe:]ESPectrum:RTYPe` on page 196).

Parameters:

<State> ON | OFF

*RST: ON

Example: `ESP:RTYP CPOW`
Sets the power reference type to channel power.
`ESP:FILT OFF`
Deactivates the use of an RRC filter.

[SENSe:]ESPectrum:FILTer[:RRC]:ALPHa <Value>

This command sets the alpha value of the RRC filter. This setting takes only effect if channel power is selected as power reference type (`[SENSe:]ESPectrum:RTYPe` command) and if the RRC filter is activated (`[SENSe:]ESPectrum:FILTer[:RRC][:STATe]` command).

Parameters:

<Value> 0 to 1

*RST: 0.22

Example: `ESP:RTYP CPOW`
Sets the power reference type to channel power.
`ESP:FILT ON`
Activates the use of an RRC filter.
`ESP:FILT:ALPH 0.5`
Sets the alpha value of the RRC filter to 0.5.

[SENSe:]ESPectrum:HighSPeed <State>

This command activates Fast SEM mode to accelerate spurious emission mask measurements. For details see chapter 3.3.9, "Fast Spectrum Emission Mask Measurements", on page 119.

Note that in Fast SEM mode, the following parameters cannot be changed in all ranges:

- Filter type, see [SENSe:]ESPectrum:RANGe<range>:FILTer:TYPE on page 190
- RBW, see [SENSe:]ESPectrum:RANGe<range>:BANDwidth[:RESolution] on page 189
- VBW, see [SENSe:]ESPectrum:RANGe<range>:BANDwidth:VIDeo on page 189
- Sweep Time Mode, see [SENSe:]ESPectrum:RANGe<range>:SWEep:TIME:AUTO on page 195
- Sweep Time, see [SENSe:]ESPectrum:RANGe<range>:SWEep:TIME on page 195
- Reference level, see [SENSe:]ESPectrum:RANGe<range>:RLEVel on page 195
- RF Att Mode, see [SENSe:]ESPectrum:RANGe<range>:INPut:ATTenuation:AUTO on page 192
- Rf Attenuation, see [SENSe:]ESPectrum:RANGe<range>:INPut:ATTenuation on page 191
- Preamp, see [SENSe:]ESPectrum:RANGe<range>:INPut:GAIN:STATe on page 192

Parameters:

<State> ON | OFF

*RST: OFF

Example: ESP:HSP ON

[SENSe:]ESPectrum:PRESet[:STANdard]

This command selects the specified XML file under C:\r_s\instr\sem_std. If the file is stored in a subdirectory, include the relative path.

Example: ESP:PRES 'WCDMA\3GPP\DL\PowerClass_31_39.xml'
Selects the PowerClass_31_39.xml XML file in the C:\R_S\instr\sem_std\WCDMA\3GPP\DL directory.
ESP:PRES?
W-CDMA 3GPP DL (31,39)dBm
The query returns information about the selected standard, the link direction and the power class. If no standard has been selected, the query returns None.

[SENSe:]ESPectrum:PRESet:RESTore

This command copies the XML files from the C:\R_S\instr\sem_backup folder to the C:\R_S\instr\sem_std folder. Files of the same name are overwritten.

Example: ESP:PRES:REST
Restores the originally provided XML files.

[SENSe:]ESPectrum:PRESet:STORe <FileName>

This command stores the current settings as presettings in the specified XML file under `C:\r_s\instr\sem_backup`.

Parameters:
<FileName>

Example: `ESP:PRES:STOR 'WCDMA\3GPP\DL\PowerClass_31_39.xml'`
Stores the settins in the `PowerClass_31_39.xml` file in the `C:\R_S\instr\sem_std\WCDMA\3GPP\DL` directory.

[SENSe:]ESPectrum:RANGe<range>:BANDwidth[:RESolution] <Value>

This command sets the RBW value for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see `[SENSe:]ESPectrum:HighSPeed` on page 187).

Suffix:
<range> 1...20
range

Parameters:
<Value> Refer to the data sheet.
*RST: 30.0 kHz

Example: `ESP:RANG2:BAND:RES 5000`
Sets the RBW for range 2 to 5 kHz.

[SENSe:]ESPectrum:RANGe<range>:BANDwidth:VIDeo <Value>

This command sets the VBW value for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see `[SENSe:]ESPectrum:HighSPeed` on page 187).

Suffix:
<range> 1...20
range

Parameters:
<Value> Refer to the data sheet.
*RST: 10.0 MHz

Example: `ESP:RANG1:BAND:VID 5000000`
Sets the VBW for range 1 to 5 MHz.

[SENSe:]ESPectrum:RANGe<range>:COUNt

This command returns the number of defined ranges.

Suffix:
<range> 1...20
range

Example: ESP:RANG:COUNt?
Returns the number of defined ranges.

[SENSe:]ESPectrum:RANGe<range>:DELete

This command deletes the specified range. The range numbers are updated accordingly. The reference range cannot be deleted. A minimum of three ranges is mandatory.

Suffix:
<range> 1...20
range

Example: ESP:RANG4:DEL
Deletes range 4.

[SENSe:]ESPectrum:RANGe<range>:FILTer:TYPE <Type>

This command sets the filter type for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see [SENSe:]ESPectrum:HighSPeed on page 187).

Suffix:
<range> 1...20
range

Parameters:
<Type>

NORMal
Gaussian filters

CFILter
channel filters

RRC
RRC filters

PULSe
EMI (6dB) filters

P5
5 Pole filters

*RST: NORM
The available bandwidths of the filters are specified in the data sheet.

Example: ESP:RANG1:FILT:TYPE RRC
Sets the RRC filter type for range 1.

[SENSe:]ESPectrum:RANGe<range>[:FREQuency]:STARt <Frequency>

This command sets the start frequency for the specified range.

In order to change the start/stop frequency of the first/last range, select the appropriate span. If you set a span that is smaller than the overall span of the ranges, the measurement includes only the ranges that lie within the defined span and have a minimum span of 20 Hz. The first and last range are adapted to the given span as long as the minimum span of 20 Hz is not violated.

Note the rules for the <Frequency> parameter specified in chapter 3.3.5, "Ranges and Range Settings", on page 109.

Suffix:
<range> 1...20
range

Parameters:
<Frequency> numeric value
*RST: -250.0 MHz (range 1), -2.52 MHz (range 2), 2.52 MHz (range 3)

Example: `ESP:RANG1:STAR 100000000`
Sets the start frequency for range 1 to 100 MHz.

[SENSe:]ESPectrum:RANGe<range>[:FREQuency]:STOP <Frequency>

This command sets the stop frequency for the specified range. For further details refer to the `[SENSe:]ESPectrum:RANGe<range>[:FREQuency]:STARt` command.

Note the rules for the <Frequency> parameter specified in chapter 3.3.5, "Ranges and Range Settings", on page 109.

Suffix:
<range> 1...20
range

Parameters:
<Frequency> numeric value
*RST: -2.52 MHz (range 1), 2.52 MHz (range 2), 250.0 MHz (range 3)

Example: `ESP:RANG3:STOP 10000000`
Sets the stop frequency for range 2 to 10 MHz.

[SENSe:]ESPectrum:RANGe<range>:INPut:ATTenuation <Value>

This command sets the attenuation for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see `[SENSe:]ESPectrum:HighSPeed` on page 187).

Suffix:
<range> 1...20
range

Parameters:

<Value> Refer to the data sheet.

*RST: 0 dB

Example: `ESP:RANG3:INP:ATT 10`
Sets the attenuation of range 3 to 10 dB.

[SENSe:]ESPectrum:RANGe<range>:INPut:ATTenuation:AUTO <State>

This command activates or deactivates the automatic RF attenuation setting for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see `[SENSe:]ESPectrum:HighSPeed` on page 187).

Suffix:

<range> 1...20
range

Parameters:

<State> ON | OFF

*RST: ON

Example: `ESP:RANG2:INP:ATT:AUTO OFF`
Deactivates the RF attenuation auto mode for range 2.

[SENSe:]ESPectrum:RANGe<range>:INPut:GAIN:STATe <State>

This command switches the preamplifier on or off for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see `[SENSe:]ESPectrum:HighSPeed` on page 187).

Suffix:

<range> 1...20
range

Parameters:

<State> ON | OFF

*RST: OFF

Example: `ESP:RANG3:INP:GAIN:STATe ON`
Switches the preamplifier for range 3 on or off.

[SENSe:]ESPectrum:RANGe<range>:INSert <Mode>

This command inserts a new range before or after the specified range. The range numbers are updated accordingly.

Suffix:

<range> 1...20
range

Parameters:
<Mode> AFTer | BEFore

Example: `ESP:RANG3:INS BEF`
Inserts a new range before range 3.
`ESP:RANG1:INS AFT`
Inserts a new range after range 1.

[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:ABSolute:STARt <Level>

This command sets an absolute limit value at the start frequency of the specified range. Different from manual operation, this setting is independently of the defined limit check type.

Suffix:
<range> 1...20
range

Parameters:
<Level> -400 to in 400 dBm
*RST: 13 dBm

Example: `ESP:RANG1:LIM:ABS:STAR 10`
Sets an absolute limit of 10 dBm at the start frequency of the range.

[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:ABSolute:STOP <Level>

This command sets an absolute limit value at the stop frequency of the specified range. Different from manual operation, this setting is independent of the defined limit check type.

Suffix:
<range> 1...20
range

Parameters:
<Level> -400 to in 400 dBm
*RST: 13 dBm

Example: `ESP:RANG1:LIM:ABS:STOP 20`
Sets an absolute limit of 20 dBm at the stop frequency of the range.

[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:RELative:STARt <Limit>

This command sets a relative limit value at the start frequency of the specified range. Different from manual operation, this setting is independent of the defined limit check type.

Suffix:
<range> 1...20
range

Parameters:

<Limit> -400 to in 400 dBc

*RST: -50 dBc

Example: `ESP:RANG3:LIM:REL:STAR -20`

Sets a relative limit of -20 dBc at the start frequency of the range.

[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:RELative:STOP <Limit>

This command sets a relative limit value at the stop frequency of the specified range. Different from manual operation, this setting is independently of the defined limit check type.

Suffix:

<range> 1...20
range

Parameters:

<Limit> -400 to in 400 dBc

*RST: -50 dBc

Example: `ESP:RANG3:LIM:REL:STOP 20`

Sets a relative limit of 20 dBc at the stop frequency of the range.

[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:STATe <State>

This command sets the type of limit check for all ranges.

Suffix:

<range> irrelevant

Parameters:

<State> ABSolute | RELative | AND | OR

ABSolute
Checks only the absolute limits defined.

RELative
Checks only the relative limits. Relative limits are defined as relative to the measured power in the reference range.

AND
Combines the absolute and relative limit. The limit check fails when both limits are violated.

OR
Combines the absolute and relative limit. The limit check fails when one of the limits is violated.

*RST: REL

Example: `ESP:RANG3:LIM:STAT AND`

Sets for all ranges the combined absolute/relative limit check.

[SENSe:]ESPectrum:RANGe<range>:RLEVel <Value>

This command sets the reference level for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see `[SENSe:]ESPectrum:HighSPeed` on page 187).

Suffix:
<range> 1...20
range

Parameters:
<Value> Refer to the data sheet.
*RST: -20 dBm

Example: `ESP:RANG2:RLEV 0`
Sets the reference level of range 2 to 0 dBm.

[SENSe:]ESPectrum:RANGe<range>:SWEep:TIME <SweepTime>

This command sets the sweep time for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see `[SENSe:]ESPectrum:HighSPeed` on page 187).

Suffix:
<range> 1...20
range

Parameters:
<SweepTime> Allowed values depend on the ratio of span to RBW and RBW to VBW. For details refer to the data sheet.
*RST: 0.27 s

Example: `ESP:RANG1:SWE:TIME 1`
Sets the sweep time for range 1 to 1 s.

[SENSe:]ESPectrum:RANGe<range>:SWEep:TIME:AUTO <State>

This command activates or deactivates the automatic sweep time setting for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see `[SENSe:]ESPectrum:HighSPeed` on page 187).

Suffix:
<range> 1...20
range

Parameters:
<State> ON | OFF
*RST: ON

Example: `ESP:RANG3:SWE:TIME:AUTO OFF`
Deactivates the sweep time auto mode for range 3.

[SENSe:]ESPectrum:RANGe<range>:TRANsducer <TransducerName>

This command sets a transducer for the specified range. You can only choose a transducer that fulfills the following conditions:

- The transducer overlaps or equals the span of the range.
- The x-axis is linear.
- The unit is dB.

Suffix:
<range> 1...20
range

Parameters:
<TransducerName> 'string' = name of the transducer

Example: `ESP:RANG1:TRAN 'test'`
Sets the transducer called test for range 1.

[SENSe:]ESPectrum:RRANge

This command returns the current position (number) of the reference range.

Example: `ESP:RRAN?`
Returns the current position (number) of the reference range.

[SENSe:]ESPectrum:RTYPe <Type>

This command sets the power reference type.

Parameters:
<Type> PEAK | CPOWer

PEAK
Measures the highest peak within the reference range.

CPOWer
Measures the channel power within the reference range (integral bandwidth method).

*RST: CPOWer

Example: `ESP:RTYP PEAK`
Sets the peak power reference type.

4.6.3.3 SENSe:BANDwidth subsystem

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[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO 197
[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT 197

[SENSe:]BANDwidth|BWIDth[:RESolution]:RATio....198
[SENSe:]BANDwidth|BWIDth[:RESolution]:TYPE....198
[SENSe:]BANDwidth|BWIDth:VIDeo....199
[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO....199
[SENSe:]BANDwidth|BWIDth:VIDeo:RATio....199
[SENSe:]BANDwidth|BWIDth:VIDeo:TYPE....200

[SENSe:]BANDwidth|BWIDth[:RESolution] <Bandwidth>

This command defines the resolution bandwidth.

The available resolution bandwidths are specified in the data sheet. For details on the correlation between resolution bandwidth and filter type refer to chapter 3.3.3, "Selecting the Appropriate Filter Type", on page 107.

Parameters:

<Bandwidth> refer to data sheet

*RST: (AUTO is set to ON)

Example: `BAND 1 MHz`

Sets the resolution bandwidth to 1 MHz

[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO <State>

This command couples and decouples the resolution bandwidth to the span.

The automatic coupling adapts the resolution bandwidth to the current frequency span according to the relationship between frequency span and resolution bandwidth.

The 6 dB bandwidths 200 Hz, 9 kHz and 120 kHz and the channel filters available are not set by the automatic coupling.

Use `[SENSe:]BANDwidth|BWIDth[:RESolution]:RATio` to define the ratio RBW/span.

Parameters:

<State> ON | OFF

*RST: ON

Example: `BAND:AUTO OFF`

Switches off the coupling of the resolution bandwidth to the span.

[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT <FilterMode>

This command defines the filter mode of FFT filters by defining the partial span size. The partial span is the span which is covered by one FFT analysis.

This command is only available for sweep type "FFT".

Parameters:

<FilterMode>

AUTO
The firmware determines whether to use wide or narrow filters to obtain the best measurement results.

NARRow
The FFT filters with the smaller partial span are used. This allows you to perform measurements near a carrier with a reduced reference level due to a narrower analog prefilter.

*RST: AUTO

Example:
```
BAND:TYPE FFT
```
Select FFT filter.

Example:
```
BAND:FFT NARR
```
Select narrow partial span for FFT filter.

[SENSe:]BANDwidth|BWIDth[:RESolution]:RATio <Ratio>

This command defines the ratio between the resolution bandwidth (Hz) and the span (Hz).

Note that the ratio defined with the remote command (RBW/span) is reciprocal to that of the manual operation (span/RBW).

Parameters:

<Ratio>

Range: 0.0001 to 1
*RST: 0.01

Example:
```
BAND:RAT 0.01
```

[SENSe:]BANDwidth|BWIDth[:RESolution]:TYPE <FilterType>

This command selects the type of resolution filter.

For detailed information on filters see chapter 3.3.3, "Selecting the Appropriate Filter Type", on page 107 and chapter 3.3.4, "List of Available RRC and Channel Filters", on page 107.

When changing the filter type, the next larger filter bandwidth is selected if the same filter bandwidth is not available for the new filter type.

5 Pole filters are not available when using the sweep type "FFT".

Parameters:

<FilterType>

NORMal
Gaussian filters

CFILter
channel filters

RRC
RRC filters

P5
5 Pole filters

*RST: NORMal

Example: `BAND:TYPE NORM`

[SENSe:]BANDwidth|BWIDth:VIDeo <Bandwidth>

This command defines the video bandwidth. The available video bandwidths are specified in the data sheet.

Parameters:

<Bandwidth>

refer to data sheet

*RST: (AUTO is set to ON)

Example: `BAND:VID 10 kHz`

[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO <State>

This command couples and decouples the VBW to the RBW.

Use `[SENSe:]BANDwidth|BWIDth:VIDeo:RATio` to define the ratio VBW/RBW.

Parameters:

<State>

ON | OFF

*RST: ON

Example: `BAND:VID:AUTO OFF`

[SENSe:]BANDwidth|BWIDth:VIDeo:RATio <Ratio>

This command defines the ratio between video bandwidth (Hz) and resolution bandwidth (Hz).

Note that the ratio defined with the remote command (VBW/RBW) is reciprocal to that of the manual operation (RBW/VBW).

Parameters:

<Ratio>

Range: 0.01 to 1000
*RST: 3

Example: `BAND:VID:RAT 3`
Sets the coupling of video bandwidth to video bandwidth = 3*resolution bandwidth

[SENSe:]BANDwidth|BWIDth:VIDeo:TYPE <Mode>

This command selects the position of the video filter in the signal path.

Changing the video filter position is possible only if the resolution bandwidth is ≤100 kHz.

Parameters:

<Mode>

LINear
The video filter is applied in front of the logarithmic amplifier.
In linear mode, measurements with a logarithmic level scale result in flatter falling edges compared to logarithmic mode. The reason is the conversion of linear power values into logarithmic level values: if you halve the linear power, the logarithmic level decreases by 3 dB.

LOGarithmic
The video filter is applied after the logarithmic amplifier.

*RST: LINear

Example:

```
BAND:VID:TYPE LIN
```

Video filter ahead of the logarithmic amplifier

4.6.3.4 SENSe:FREQuency subsystem

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[SENSe:]FREQuency:CENTer:STEP....200
[SENSe:]FREQuency:CENTer:STEP:AUTO....201
[SENSe:]FREQuency:CENTer:STEP:LINK....201
[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor....201
[SENSe:]FREQuency:OFFSet....202
[SENSe:]FREQuency:SPAN....202
[SENSe:]FREQuency:SPAN:FULL....202
[SENSe:]FREQuency:STARt....202
[SENSe:]FREQuency:STOP....202

[SENSe:]FREQuency:CENTer <Frequency>

This command defines the center frequency (frequency domain) or measuring frequency (time domain).

Parameters:

<Frequency>

Range: 0 to fmax
*RST: fmax/2
Default unit: Hz
f_{max} is specified in the data sheet. min span is 10 Hz

Example:

```
FREQ:CENT 100 MHz
```

[SENSe:]FREQuency:CENTer:STEP <StepSize>

This command defines the center frequency step size.

Parameters:

<StepSize> Range: 1 to fmax
*RST: 0.1 x <span value>
Default unit: Hz

Example: `FREQ:CENT:STEP 120 MHz`

[SENSe:]FREQuency:CENTer:STEP:AUTO <State>

This command couples the step size of the center frequency to the span (ON) or sets the value of the center frequency entered via `[SENSe:]FREQuency:CENTer` (OFF).

Parameters:

<State> ON | OFF
*RST: ON

Example: `FREQ:CENT:STEP:AUTO ON`
Activates the coupling of the step size to the span.

[SENSe:]FREQuency:CENTer:STEP:LINK <CouplingType>

This command couples and decouples the center frequency step size to the span or the resolution bandwidth.

Parameters:

<CouplingType>

SPAN
Couples the step size to the span. Available for measurements in the frequency domain.

RBW
Couples the step size to the resolution bandwidth. Available for measurements in the time domain.

OFF
Decouples the step size (manual input).

*RST: SPAN

Example: `FREQ:CENT:STEP:LINK SPAN`

[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor <Factor>

This command defines a step size factor if the center frequency step size is coupled to the span or the resolution bandwidth.

Parameters:

<Factor> Range: 1 to 100
*RST: 10
Default unit: PCT

Example: `FREQ:CENT:STEP:LINK:FACT 20PCT`

[SENSe:]FREQuency:OFFSet <Offset>

This command defines the frequency offset.

Parameters:

<Offset> Range: -100 GHz to 100 GHz
*RST: 0 Hz
Default unit: Hz

Example: `FREQ:OFFS 1GHZ`

[SENSe:]FREQuency:SPAN <Span>

This command defines the frequency span.

Parameters:

<Span> min span to fmax

*RST: fmax
f_{max} is specified in the data sheet. min span is 10 Hz

Example: `FREQ:SPAN 10MHz`

[SENSe:]FREQuency:SPAN:FULL

This command sets the frequency span to its maximum.

Example: `FREQ:SPAN:FULL`

[SENSe:]FREQuency:STARt <Frequency>

This command defines the start frequency for measurements in the frequency domain.

Parameters:

<Frequency> 0 to (fmax - min span)

*RST: 0
f_{max} is specified in the data sheet. min span is 10 Hz

Example: `FREQ:STAR 20MHz`

[SENSe:]FREQuency:STOP <Frequency>

This command defines the stop frequency for measurements in the frequency domain.

Parameters:

<Frequency> min span to fmax

*RST: fmax
f_{max} is specified in the data sheet. min span is 10 Hz

Example: `FREQ:STOP 2000 MHz`

4.6.3.5 SENSe:POWer subsystem

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[SENSe:]POWer:ACHannel:BANDwidth|BWIDth[:CHANnel<channel>]....203
[SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ACHannel....204
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[SENSe:]POWer:ACHannel:FILTer:ALPHa:ACHannel....205
[SENSe:]POWer:ACHannel:FILTer:ALPHa:ALTernate<channel>....205
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[SENSe:]POWer:ACHannel:FILTer[:STATe]:ACHannel....205
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[SENSe:]POWer:ACHannel:NAME:ACHannel....207
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[SENSe:]POWer:ACHannel:REFerence:TXCHannel:MANual....209
[SENSe:]POWer:ACHannel:SPACing[:ACHannel]....209
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[SENSe:]POWer:ACHannel:ACPairs <ChannelPairs>

This command sets the number of adjacent channels (upper and lower channel in pairs).The figure 0 stands for pure channel power measurement.

Parameters:

<ChannelPairs> 0 to 12

*RST: 1

Example: `POW:ACH:ACP 3`

Sets the number of adjacent channels to 3, i.e. the adjacent channel and alternate adjacent channels 1 and 2 are switched on.

[SENSe:]POWer:ACHannel:BANDwidth|BWIDth[:CHANnel<channel>] <Bandwidth>

This command sets the channel bandwidth of the specified TX channel in the radio communication system. The bandwidths of adjacent channels are not influenced by this modification.

With [SENSe<source>:]POWer:HSPeed set to ON, steep-edged channel filters are available. For further information on filters refer to chapter 3.3.4, "List of Available RRC and Channel Filters", on page 107.

Parameters:

<Bandwidth> 100 Hz to 40 GHz

*RST: 14 kHz

Example: POW:ACH:BWID:CHAN2 30 kHz

Sets the bandwidth of the TX channel 2 to 30 kHz.

[SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ACHannel <Bandwidth>

This command defines the channel bandwidth of the adjacent channel of the radio transmission system. If the bandwidth of the adjacent channel is changed, the bandwidths of all alternate adjacent channels are automatically set to the same value.

With [SENSe<source>:]POWer:HSPeed set to ON, steep-edged channel filters are available. For further information on filters refer to chapter 3.3.4, "List of Available RRC and Channel Filters", on page 107 .

Parameters:

<Bandwidth> 100 Hz to 40 GHz

*RST: 14 kHz

Example: POW:ACH:BWID:ACH 30 kHz

Sets the bandwidth of all adjacent channels to 30 kHz.

[SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ALTernate<channel>
<Bandwidth>

This command defines the channel bandwidth of the specified alternate adjacent channels of the radio transmission system. If the channel bandwidth of one alternate adjacent channel is changed (e.g. channel 3), the bandwidth of all subsequent alternate adjacent channels (e.g. 4–11) is automatically set to the same value.

With [SENSe<source>:]POWer:HSPeed set to ON, steep-edged channel filters are available. For further information on filters refer to chapter 3.3.4, "List of Available RRC and Channel Filters", on page 107 .

Suffix:

<channel> 1...11

the alternate adjacent channel

Parameters:

<Bandwidth> 100 Hz to 40 GHz

*RST: 14 kHz

Example: POW:ACH:BWID:ALT2 30 kHz

[SENSe:]POWer:ACHannel:FILTer:ALPHa:ACHannel <Alpha>

This command defines the roll-off factor for the weighting filter of the adjacent channel.

Parameters:

<Alpha> <numeric value>

*RST: 0,22

Example: `POW:ACH:FILT:ALPH:ACH 0,35`

[SENSe:]POWer:ACHannel:FILTer:ALPHa:ALTernate<channel> <Alpha>

This command defines the roll-off factor for the weighting filter of the specified alternate channel.

Suffix:

<channel> 1...11
the alternate channel

Parameters:

<Alpha> <numeric value>

*RST: 0,22

Example: `POW:ACH:FILT:ALPH:ALT3 0,35`
Sets the alpha value for the weighting filter for the alternate channel 3 to 0,35.

[SENSe:]POWer:ACHannel:FILTer:ALPHa:CHANnel<channel> <Alpha>

This command defines the roll-off factor for the weighting filter of the specified TX channel.

Suffix:

<channel> 1...11
the TX channel

Parameters:

<Alpha> <numeric value>

*RST: 0,22

Example: `POW:ACH:FILT:ALPH:CHAN3 0,35`
Sets the alpha value for the weighting filter for the TX channel 3 to 0,35.

[SENSe:]POWer:ACHannel:FILTer[:STATe]:ACHannel <State>

This command activates the weighting filter for the adjacent channel.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `POW:ACH:FILT:ACH ON`

[SENSe:]POWer:ACHannel:FILTer[:STATe]:ALTernate<channel> <State>

This command activates the weighting filter for the specified alternate channel.

Suffix:
<channel> 1...11
the alternate adjacent channel

Parameters:
<State> ON | OFF
*RST: OFF

Example: `POW:ACH:FILT:ALT3 ON`
Activates the weighting filter for alternate channel 3.

[SENSe:]POWer:ACHannel:FILTer[:STATe]:CHANnel<channel> <State>

This command activates the weighting filter for the specified TX channel.

Suffix:
<channel> 1...18
the TX channel

Parameters:
<State> ON | OFF
*RST: OFF

Example: `POW:ACH:FILT:CHA3 ON`
Activates the weighting filter for TX channel 3.

[SENSe:]POWer:ACHannel:MODE <Mode>

This command switches between absolute and relative adjacent channel measurement. The command is only available with span > 0 and if the number of adjacent channels is greater than 0.

For the relative measurement the reference value is set to the currently measured channel power using the command `[SENSe:]POWer:ACHannel:REFerence:AUTO ONCE`.

Parameters:
<Mode> ABSolute | RELative

ABSolute
absolute adjacent channel measurement

RELative
relative adjacent channel measurement

*RST: RELative

Example: `POW:ACH:MODE REL`
Sets the adjacent channel measurement mode to relative.

[SENSe:]POWer:ACHannel:NAME:ACHannel <Name>

This command defines a name for the adjacent channel. The name is displayed in the result diagram and the result table.

Parameters:
<Name> *RST: Adj

Example: `POW:ACH:NAME:ACH 'XYZ'`
Defines the name of the adjacent channel as 'XYZ'.

[SENSe:]POWer:ACHannel:NAME:ALTernate<channel> <Name>

This command defines a name for the specified alternate channel. The name is displayed in the result diagram and the result table.

Suffix:
<channel> 1...11
the alternate channel

Parameters:
<Name> *RST: ALT<1...11>

Example: `POW:ACH:NAME:ALT3 'XYZ'`
Defines the name of the third alternate channel as 'XYZ'.

[SENSe:]POWer:ACHannel:NAME:CHANnel<channel> <Name>

This command defines a name for the specified TX channel. The name is displayed in the result diagram and the result table.

Suffix:
<channel> 1...12
the TX channel

Parameters:
<Name> *RST: TX<1...12>

Example: `POW:ACH:NAME:CHAN3 'XYZ'`
Defines the name of the third transmission channel as 'XYZ'.

[SENSe:]POWer:ACHannel:PRESet <Setting>

This command adjusts the frequency span, the measurement bandwidths and the detector as required for the number of channels, the channel bandwidths and the channel spacings selected in the active power measurement. If necessary, adjacent-channel power measurement is switched on prior to the adjustment.

To obtain correct results, a complete sweep with synchronization to the end of the sweep must be performed after the adjustment. Synchronization is possible only in the single sweep mode.

The result is queried with the CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult? command.

Parameters:

<Setting> ACPower | CPOWer | MCACpower | OBANdwidth | OBWidth | CN | CN0

Example: POW:ACH:PRES ACP
Sets the frequency span, the measurement bandwidths and the detector as required for the ACLR measurement.
INIT:CONT OFF
Switches over to single sweep mode.
INIT;*WAI
Starts a sweep and waits for the end of the sweep.
CALC:MARK:FUNC:POW:RES? ACP
Queries the result of the adjacent-channel power measurement.

[SENSe:]POWer:ACHannel:PRESet:RLEVel

This command adapts the reference level to the measured channel power and – if required – switches on previously the adjacent channel power measurement. This ensures that the signal path of the instrument is not overloaded. Since the measurement bandwidth is significantly smaller than the signal bandwidth in channel power measurements, the signal path can be overloaded although the trace is still significantly below the reference level. If the measured channel power equals the reference level, the signal path is not overloaded.

Subsequent commands have to be synchronized with *WAI, *OPC or *OPC? to the end of the auto range process which would otherwise be aborted.

Example: POW:ACH:PRES:RLEV;*WAI
Adapts the reference level to the measured channel power.

[SENSe:]POWer:ACHannel:REFerence:AUTO ONCE

This command sets the reference value to the currently measured channel power for the relative measurement.

Example: POW:ACH:REF:AUTO ONCE

[SENSe:]POWer:ACHannel:REFerence:TXCHannel:AUTO <Channel>

This command activates the automatic selection of a transmission channel to be used as a reference channel in relative adjacent-channel power measurements.

The transmission channel with the highest power, the transmission channel with the lowest power, or the transmission channel nearest to the adjacent channels can be defined as a reference channel.

The command is available only for multicarrier channel and adjacent-channel power measurements with span > 0 (CALCulate<n>:MARKer<m>:FUNCtion:POWer:SELect on page 134).

Parameters:

<Channel> MINimum | MAXimum | LHIGhest

MINimum
Transmission channel with the lowest power

MAXimum
Transmission channel with the highest power

LHIGhest
Lowermost transmission channel for the lower adjacent channels, uppermost transmission channel for the upper adjacent channels

Example: `POW:ACH:REF:TXCH:AUTO MAX`
The transmission channel with the highest power is used as a reference channel.

[SENSe:]POWer:ACHannel:REFerence:TXCHannel:MANual <ChannelNumber>

This command selects a transmission channel to be used as a reference channel in relative adjacent-channel power measurements.

The command is available only for multicarrier channel and adjacent-channel power measurements with span > 0 (`CALCulate<n>:MARKer<m>:FUNCtion:POWer:SELect` on page 134).

Parameters:

<ChannelNumber> 1 to 18

*RST: 1

Example: `POW:ACH:REF:TXCH:MAN 3`
Transmission channel 3 is used as a reference channel.

[SENSe:]POWer:ACHannel:SPACing[:ACHannel] <Spacing>

This command defines the spacing between the carrier signal and the adjacent channel (ADJ). The modification of the adjacent-channel spacing (ADJ) causes a change in all higher adjacent-channel spacings (ALT1, ALT2, ...): they are all multiplied by the same factor (new spacing value/old spacing value).

Parameters:

<Spacing> 100 Hz to 20 GHz

*RST: 14 kHz

Example: `POW:ACH:SPAC 33kHz`
Sets the spacing between the carrier signal and the adjacent channel to 33 kHz, the alternate adjacent channel 1 to 66 kHz, the alternate adjacent channel 2 to 99 kHz, and so on.

[SENSe:]POWer:ACHannel:SPACing:ALTernate<channel> <Spacing>

This command defines the spacing between the alternate adjacent channels and the TX channel (ALT1, ALT2, ...). A modification of a higher adjacent-channel spacing causes a change by the same factor (new spacing value/old spacing value) in all higher adjacent-channel spacings, while the lower adjacent-channel spacings remain unchanged.

Suffix:
<channel> 1...11
the alternate adjacent channel

Parameters:
<Spacing> 100 Hz to 20 GHz
*RST: 40 kHz (ALT1), 60 kHz (ALT2), 80 kHz (ALT3), ...

Example: `POW:ACH:SPAC:ALT1 100 kHz`
Sets the spacing between TX channel and alternate adjacent channel 1 (ALT1) from 40 kHz to 100 kHz. In consequence, the spacing between the TX channel and all higher alternate adjacent channels is increased by the factor 100/40 = 2.5: ALT2 = 150 kHz, ALT3 = 200 kHz, ALT4 = 250 kHz.

[SENSe:]POWer:ACHannel:SPACing:CHANnel<channel> <Spacing>

This command defines the channel spacing for the carrier signals.

Suffix:
<channel> 1...11
the TX channel

Parameters:
<Spacing> 14 kHz to 20 GHz
*RST: 20 kHz

Example: `POW:ACH:SPAC:CHAN 25kHz`

[SENSe:]POWer:ACHannel:TXCHannel:COUNt <Number>

This command selects the number of carrier signals.

The command is available only for multicarrier channel and adjacent-channel power measurements with span > 0 (see `CALCulate<n>:MARKer<m>:FUNCtion:POWer:SELect` on page 134).

Parameters:
<Number> 1 to 18
*RST: 1

Example: `POW:ACH:TXCH:COUN 3`

[SENSe:]POWer:BANDwidth|BWIDth <Percentage>

This command defines the percentage of the power with respect to the total power.

This value is the basis for the occupied bandwidth measurement (see `[SENSe:]POWer:ACHannel:PRESet` on page 207).

Parameters:

<Percentage> 10 to 99.9PCT

*RST: 99PCT

Example: `POW:BWID 95PCT`

[SENSe:]POWer:HSPeed <State>

This command switches on or off the high-speed channel/adjacent channel power measurement. The measurement itself is performed in zero span on the center frequencies of the individual channels. The command automatically switches to zero span and back.

Depending on the selected mobile radio standard, weighting filters with characteristic or very steep-sided channel filters are used for band limitation.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `POW:HSP ON`

[SENSe:]POWer:NCORrection <Mode>

This command turns noise cancellation on and off.

If noise cancellation is on, the R&S FSV performs a reference measurement to determine its inherent noise and subtracts the result from the channel power measurement result (first active trace only).

The inherent noise of the instrument depends on the selected center frequency, resolution bandwidth and level setting. Therefore, the correction function is disabled whenever one of these parameters is changed. A corresponding message is displayed on the screen. Noise correction must be turned on again manually after the change.

Parameters:

<Mode>

ON
Performs noise correction.

OFF
Performs no noise correction.

AUTO
Performs noise correction.
After a parameter change, noise correction is restarted automatically and a new correction measurement is performed.

*RST: OFF

Example: POW:NCOR ON

[SENSe:]POWer:TRACe <TraceNumber>

This command assigns the channel/adjacent channel power measurement to the indicated trace. The corresponding trace must be active, i.e. its state must be different from blank.

Note: The measurement of the occupied bandwidth (OBW) is performed on the trace on which marker 1 is positioned. To evaluate another trace, marker 1 must be positioned to another trace with CALCulate<n>:MARKer<m>:TRACe.

Parameters:
<TraceNumber> 1 to 6

Example: POW:TRAC 2
Assigns the measurement to trace 2.

4.6.3.6 SENSe:SWEep subsystem

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[SENSe:]SWEep:EGATe:HOLDoff....213
[SENSe:]SWEep:EGATe:LENGth....214
[SENSe:]SWEep:EGATe:POLarity....214
[SENSe:]SWEep:EGATe:SOURce....214
[SENSe:]SWEep:EGATe:TRACe<k>:COMMent....214
[SENSe:]SWEep:EGATe:TRACe<k>: PERiod....214
[SENSe:]SWEep:EGATe:TRACe<k>:STARt<range>....215
[SENSe:]SWEep:EGATe:TRACe<k>[:STATe<range>]....215
[SENSe:]SWEep:EGATe:TYPE....215
[SENSe:]SWEep:EGATe:TRACe<k>: STOP<range>....216
[SENSe:]SWEep:POINts....216
[SENSe:]SWEep:TIME....217
[SENSe:]SWEep:TIME:AUTO....217
[SENSe:]SWEep:TYPE....217

[SENSe:]SWEep:COUNt <NumberSweeps>

This command defines the number of sweeps started with single sweep, which are used for calculating the average or maximum value. If the values 0 or 1 are set, one sweep is performed.

Parameters:
<NumberSweeps> 0 to 32767
*RST: 0 (GSM: 200, PHN:1)

Example:
```
SWE:COUN 64
```
Sets the number of sweeps to 64.
```
INIT:CONT OFF
```
Switches to single sweep mode.
```
INIT;*WAI
```
Starts a sweep and waits for its end.

[SENSe:]SWEep:EGATe <State>

This command switches on/off the sweep control by an external gate signal. If the external gate is selected the trigger source is automatically switched to EXTernal as well.

In case of measurement with external gate, the measured values are recorded as long as the gate is opened. During a sweep the gate can be opened and closed several times. The synchronization mechanisms with *OPC, *OPC? and *WAI remain completely unaffected.

The sweep end is detected when the required number of measurement points (691 in "Spectrum" mode) has been recorded.

Parameters:

<State> ON | OFF

*RST: OFF

Example:
```
SWE:EGAT ON
```
Switches on the external gate mode.
```
SWE:EGAT:TYPE EDGE
```
Switches on the edge-triggered mode.
```
SWE:EGAT:HOLD 100US
```
Sets the gate delay to 100 µs.
```
SWE:EGAT:LEN 500US
```
Sets the gate opening time to 500 µs.
```
INIT;*WAI
```
Starts a sweep and waits for its end.

[SENSe:]SWEep:EGATe:HOLDoff <DelayTime>

This command defines the delay time between the external gate signal and the continuation of the sweep.

Note: Using gate mode "level" (see `[SENSe:]SWEep:EGATe:TYPE` on page 215) and an IFP trigger (see `TRIGger<n>[:SEQuence]:SOURce` on page 233), the holdoff time for the IFP trigger is ignored for frequency sweep, FFT sweep, zero span and IQ mode measurements.

Parameters:

<DelayTime> 0 s to 30 s

*RST: 0s

Example:
```
SWE:EGAT:HOLD 100us
```

[SENSe:]SWEep:EGATe:LENGth <TimeInterval>

This command defines a gate length.

Parameters:
<TimeInterval> 125 ns to 30 s
*RST: 400µs

Example: `SWE:EGAT:LENG 10ms`

[SENSe:]SWEep:EGATe:POLarity <Polarity>

This command determines the polarity of the external gate signal. The setting applies both to the edge of an edge-triggered signal and the level of a level-triggered signal.

Parameters:
<Polarity> POSitive | NEGative
*RST: POSitive

Example: `SWE:EGAT:POL POS`

[SENSe:]SWEep:EGATe:SOURce <Source>

This command selects the signal source for gated measurements.

If an IF power signal is used, the gate is opened as soon as a signal at > -20 dBm is detected within the IF path bandwidth (10 MHz).

Parameters:
<Source> EXTernal | IFPower | VIDeo | RFPower | PSEN
*RST: IFPower

Example: `SWE:EGAT:SOUR IFP`
Switches the gate source to IF power.

[SENSe:]SWEep:EGATe:TRACe<k>:COMMent <Comment>

Defines a comment for one of the traces for gated triggering.

Suffix:
<k> 1...6
trace

Parameters:
<Comment>

Example: `SWE:EGAT:TRAC1:COMM "SlotA"`

[SENSe:]SWEep:EGATe:TRACe<k>: PERiod <Value>

This command defines the length of the period to be traced using gated triggering.

Suffix:
<k> 1...6
trace

Parameters:
<Value> <numeric value>
*RST: 0 s

Example: `SWE:EGAT:TRAC1:PER 5ms`
Defines the period for gated triggering to 5 ms.

[SENSe:]SWEep:EGATe:TRACe<k>:STARt<range> <Value>

This command defines the starting point for the range to be traced using gated triggering.

Suffix:
<k> 1...6
trace

<range> 1...3
range

Parameters:
<Value> <numeric value>
*RST: OFF

Example: `SWE:EGAT:TRAC1:STAR1 3ms`
Sets the Starting point for range 1 on trace 1 at 3 ms.

[SENSe:]SWEep:EGATe:TRACe<k>[:STATe<range>] <State>

This command activates or deactivates tracing for a specific range using gated triggering.

Suffix:
<k> 1...6
trace

<range> 1...3
range

Parameters:
<State> ON | OFF
*RST: OFF

Example: `SWE:EGAT:TRAC1:STAT1 ON`
Activates tracing for range 1 of trace 1.

[SENSe:]SWEep:EGATe:TYPE <Type>

This command sets the type of triggering by the external gate signal.

A delay between applying the gate signal and the start of recording measured values can be defined, see `[SENSe:]SWEep:EGATe:HOLDoff` on page 213.

Parameters:

<Type> LEVel | EDGE

LEVel
The gate is level-triggered:
After detection of the gate signal, the gate remains open until the gate signal disappears. The gate opening time cannot be defined with the command `[SENSe:]SWEep:EGATe:HOLDoff`.
Note: Using gating with gate mode "level" and an IFP trigger (see `TRIGger<n>[:SEQuence]:SOURce` on page 233), the holdoff time for the IFP trigger is ignored for frequency sweep, FFT sweep, zero span and IQ mode measurements.

EDGE
The gate is edge-triggered:
After detection of the set gate signal edge, the gate remains open until the gate delay (`[SENSe:]SWEep:EGATe:HOLDoff`) has expired.

*RST: EDGE

Example: `SWE:EGAT:TYPE EDGE`

[SENSe:]SWEep:EGATe:TRACe<k>: STOP<range> <Value>

This command defines the stopping point for the range to be traced using gated triggering

Suffix:

<k> 1...6
trace

<range> 1...3
range

Parameters:

<Value> <numeric value>

*RST: 1 µs

Example: `SWE:EGAT:TRAC1:STOP1 5ms`
Sets the stopping point for range 1 on trace 1 at 5 ms.

[SENSe:]SWEep:POINts <NumberPoints>

This command defines the number of measurement points to be collected during one sweep.

Note: For Spurious Emissions measurements the maximum number of sweep points in all ranges is limited to 100001.

Parameters:

<NumberPoints> Range: 101 to 32001
*RST: 691

Example: `SWE:POIN 251`

[SENSe:]SWEep:TIME <Time>

This command defines the sweep time.

The range depends on the frequency span.

Parameters:

<Time> refer to data sheet

For R&S FSV spectrum analyzers with an FMR7 CPU board (order no. 1091.3204, with R&S FSV models 1307.9002Kxx only) and 1 GByte RAM the maximum capture time is 600 ms. Otherwise it is 1 s.

*RST: (AUTO is set to ON)

Example: `SWE:TIME 10s`

[SENSe:]SWEep:TIME:AUTO <State>

In realtime mode, this command automatically sets the sweep time to 32 ms.

In analyzer mode, this command controls the automatic coupling of the sweep time to the frequency span and bandwidth settings. If `[SENSe:]SWEep:TIME` is used, automatic coupling is switched off.

Parameters:

<State> ON | OFF

*RST: ON

Example: `SWE:TIME:AUTO ON`
Activates automatic sweep time.

[SENSe:]SWEep:TYPE <Type>

This command selects the sweep type.

Parameters:

<Type> **SWE**
Selects analog frequency sweeps.

AUTO
Automatically selects the sweep type (FFT or analog frequency sweep).

FFT
Selects FFT sweeps.

*RST: AUTO

Example: `SWE:TYPE FFT`
Selects FFT sweeps.

4.6.3.7 Other Commands in the SENSe Subsystem

[SENSe:]AVERage<n>:COUNt <NoMeasurements>

This command defines the number of measurements which contribute to the average value.

Note that continuous averaging is performed after the indicated number has been reached in continuous sweep mode.

In single sweep mode, the sweep is stopped as soon as the indicated number of measurements (sweeps) is reached. Synchronization to the end of the indicated number of measurements is only possible in single sweep mode.

This command has the same effect as the `[SENSe<source>:]SWEep:COUNt` command. In both cases, the number of measurements is defined whether the average calculation is active or not.

The number of measurements applies to all traces in the window.

Suffix:
<n> Selects the measurement window.

Parameters:
<NoMeasurements> 0 to 32767
*RST: 0

Example:
```
SWE:CONT OFF
```
Switching to single sweep mode.
```
AVER:COUN 16
```
Sets the number of measurements to 16.
```
AVER:STAT ON
```
Switches on the calculation of average.
```
INIT;*WAI
```
Starts the measurement and waits for the end of the 16 sweeps.

[SENSe:]AVERage<n>[:STATe<Trace>] <State>

This command turns averaging for a particular trace in a particular window on and off.

Suffix:
<n> Selects the measurement window.

<Trace> 1...6
Selects the trace.

Parameters:
<State> ON | OFF
*RST: OFF

Example:
```
AVER OFF
```
Switches off the average calculation for trace 1.
```
AVER:STAT3 ON
```
Switches on the average calculation for trace 3.

4.7 Status Reporting System of the TD-SCDMA Measurement Applications (K76/K77)

Detailed information on the status registers of the base system is given in section Status Reporting System. In this section, only the new and altered status registers for the "TD-SCDMA" options (K76/K77) are described.

The `STATus:QUEStionable:SYNC` register contains information on the error situation in the code domain analysis of the "TD-SCDMA" option. The bits can be queried with commands `STATus:QUEStionable:SYNC:CONDition?` and `STATus:QUEStionable:SYNC[:EVENt]?`.

STATus:QUEStionable:SYNC:CONDition?

This command reads the information on the error situation in the code domain power analysis.

Return values:

<Result> If the result is ON, an error occured. Details can be obtained using `STATus:QUEStionable:SYNC[:EVENt]?`.

*RST: OFF

Example: `STAT:QUES:SYNC:COND?`

Usage: Query only

Mode: TDS

STATus:QUEStionable:SYNC[:EVENt]?

This command reads the information on the error situation in the code domain power analysis. The value can only be read once.

Example: `STAT:QUES:SYNC[:EVEN]?`

Usage: Query only

Mode: TDS

Bit no.	Meaning
0	Not used in R&S FSV-K76/-K77 applications
1	K76 Frame sync failed This bit is set when synchronization is not possible within the application. The reasons for this can be: • Invalid frequency • Invalid level • Invalid scrambling code • Invalid max. number of MA Shifts Cell • Invalid values for INVERT Q or SIDEBAND INV • Invalid signal on input
2 to 14	Not used in the R&S FSV-K76/-K77 applications
15	This bit is always 0.

4.8 TRACe Subsystem

This chapter describes the `TRACe<n>[:DATA]` command and its characteristics for the measurement application.

TRACe<n>[:DATA]? LIST | TRACE1 | TRACE2 | TRACE3 | TRACE4, <block> | <numeric value>

This command reads trace data from the R&S FSV.

The behaviour of the command is the same as in the base unit for RF measurements. For code domain measurements and the Power vs Time measurement, find a description of the behaviour of the command below.

- **Code Domain Power (absolute and relative)**
  For the Code Domain Power result display, the command returns four values for each channel in the following order:
  <code class>, <code number>, <level>, <power detection>
  Refer to the description below for more details on the return values.
  The query returns a maximum of 16 channels. Channels that consist of more than one code are returned as one channel.
  So, for example, consider the following configuration (three active channels out of a total of 12):
  – DPCH, 1.16, (CC4), -7.0 dB
  – DPCH, 2.8, (CC3), -7.3 dB
  – DPCH, 3.4, (CC2), -8.0 dB

  In this example, the command would return the following string (active channels in **bold**):
  4, 1, -7.0, 1, 4, 2, -55.1, 0, **3, 2, -7.3, 1,** 4, 5, -56.3, 0, 4, 6, -55.8, 0, 4, 7, -57.0, 0, **2, 3, -8.0, 1,** 4, 13, -55.8, 0, 4, 14, -56.3, 0, 4, 15, -55.9, 0, 4, 16, -57.3, 0
- **Code Domain Error Power**
  For the Code Domain Error Power result display, the command returns four values for each channel in the following order:
  <code class>, <code number>, <level>, <power detection>
  Refer to the description below for more details on the return values.
  The query returns a maximum of 16 codes. One value is returned for every code.
  So, for example, consider the following configuration (three active channels out of a total of 12):
  – DPCH, 1.16, (CC4), -7.0 dB
  – DPCH, 2.8, (CC3), -7.3 dB
  – DPCH, 3.4, (CC2), -8.0 dB

  In this example, the command would return the following string (active channels in **bold**):
  4, 1, -54.5, 1, 4, 2, -55.1, 0, **3, 2, -56.3, 1, 4, 3, -56.2, 1,** 4, 5, -56.3, 0, 4, 6, -55.8, 0, 4, 7, -57.0, 0, 4, 8, -56.7, 0, **2, 3, -56.2, 1, 4, 10, -56.5, 1, 4, 11, -55.8, 1, 4, 12, -55.9, 1,** 4, 13, -55.8, 0, 4, 14, -56.3, 0, 4, 15, -55.9, 0, 4, 16, -57.3, 0

- **Channel Table**
  For the Channel Table result display, the command returns 11 values in the following order:
  <channel type>, <code class>, <code number>, <modulation type>, <absolute level in dBm>, <relative level in dB>, <midamble shift>, <midd1>, <midd1>, <reserved1>, <reserved2>
  The output depends on the channel sorting order. When using code sorting order, all midambles are output first, then control channels and last the data channels. When using midamble sorting order, each midamble is output with its corresponding control and data channel.
  So, for example, consider the following configuration (three active channels in common midamble allocation):
  – Midamble m(3), -3.0 dBm
  – DPCH, 1.16, QPSK, -7.78 dB
  – DPCH, 2.8, QPSK, -7.78 dB
  – DPCH, 3.4, 8PSK, -7.78 dB

  In this example, the command would return the following string:
  `1, 0, 0, 0, -3.0, 0, 3, 0.005, 0.005, 0, 0 2 , 4, 1, 1, -7.78, -4.78, 3, 0, 0, 0, 0 2 , 3, 2, 1, -7.78, -4.78, 3, 0, 0, 0, 0 2 , 2, 3, 2, -7.78, -4.78, 3, 0, 0, 0, 0 0 , 4, 2, 1, -46.9, -43.9, 3, 0, 0, 0, 0 0 , 4, 5, 1, -46.9, -43.9, 3, 0, 0, 0, 0 0 , 4, 6, 1, -46.9, -43.9, 3, 0, 0, 0, 0 0 , 4, 7, 1, -46.9, -43.9, 3, 0, 0, 0, 0 0 , 4, 8, 1, -46.9, -43.9, 3, 0, 0, 0, 0 0 , 4, 13, 1, -46.9, -43.9, 3, 0, 0, 0, 0 0 , 4, 14, 1, -46.9, -43.9, 3, 0, 0, 0, 0 0 , 4, 15, 1, -46.9, -43.9, 3, 0, 0, 0, 0 0 , 4, 16, 1, -46.9, -43.9, 3, 0, 0, 0, 0`
- **Result Summary**
  For the Result Summary, the command returns 25 values in the following order:
  <slot>, <pdata>, <pd1>, <pd2>, <pmidamble>, <rho>, <maccuracy>, <pcderror>, <ferror>, <cerror>, <tframe>, <iqimbalance>, <iqoffset>, <active>, <srate>, <channel>, <sfactor>, <cdprelative>, <cdpabsolute>, <evmrms>, <evmpeak>, <reserved1>, <reserved2>, <reserved3>, <reserved4>
- **Power vs Slot**
  For the Power vs Slot result display, the command returns three values in the following order:
  Power vs Slot Absolute: <slot number>, <level in dbm>, <validity>
  Power vs Slot Relative: <slot number>, <level in db>, <validity>
  The number of triplets the command returns depends on the capture length.
- **Peak Code Domain Error**
  For the Peak Code Domain Error result display, the command returns two values in the following order:
  Power vs Slot Absolute: <slot>, <level in dbm>, <validity>
  The number of pairs the command return depends on the capture length.
- **Composite EVM**
  For the Composite EVM result display, the command returns two values for every slot in the following order:
  <slot 0>, <maccuracy 0>, ..., <slot n>, <maccuracy n>
  The number of pairs the command return depends on the capture length.

- **Symbol EVM**
  For the Symbol EVM result display, the command returns one value for each symbol:
  <value in % symbol 0>, <value in % symbol 1>, ..., <value in % symbol n>
  The number of symbols depends on the spreading factor:
  – Spreading Factor 16: 44 symbols
  – Spreading Factor 8: 88 symbols
  – Spreading Factor 4: 176 symbols
  – Spreading Factor 2: 352 symbols
  – Spreading Factor 1: 704 symbols
- **Power vs Symbol**
  For the Power vs Symbol result display, the command returns one value for each symbol:
  <value in dbm symbol 0>, <value in dbm symbol 1>, ..., <value in % symbol n>
  The number of symbols depends on the spreading factor:
  – Spreading Factor 16: 44 symbols
  – Spreading Factor 8: 88 symbols
  – Spreading Factor 4: 176 symbols
  – Spreading Factor 2: 352 symbols
  – Spreading Factor 1: 704 symbols
- **Symbol Constellation**
  For the Symbol Constellation result display, the command returns one value each for the real and imaginary parts of every symbol:
  <re 0>, <im 0>, <re 1>, <im 1>, ..., <re n>, <im n>
  The number of symbols depends on the spreading factor:
  – Spreading Factor 16: 44 symbols
  – Spreading Factor 8: 88 symbols
  – Spreading Factor 4: 176 symbols
  – Spreading Factor 2: 352 symbols
  – Spreading Factor 1: 704 symbols
- **Composite Constellation**
  For the Composite Constellation result display, the command returns one value each for the real and imaginary parts of every data chip:
  <re 0>, <im 0>, <re 1>, <im 1>, ..., <re 703>, <im 703 >
- **Bit Stream**
  For the Bitsream result display, the command returns the bitstream of one slot, i.e. it returns one value for every bit (either 0 or 1) in a symbol in the following order:
  <bit 1>, <bit 2>, ...,<bit n >
  The number of bits depends on the modulation and the spreading factor:
  – **Spreading Factor 16**
    QPSK: 88 bits, 8PSK: 132 bits, 16QAM: 176 bits, 64QAM: 264 bits
  – **Spreading Factor 8**
    QPSK: 176 bits, 8PSK: 264 bits, 16QAM: 352 bits, 64QAM: 528 bits
  – **Spreading Factor 4**
    QPSK: 352 bits, 8PSK: 528 bits, 16QAM: 704 bits, 64QAM: 1056 bits
  – **Spreading Factor 2**

QPSK: 704 bits, 8PSK: 1056 bits, 16QAM: 1408 bits, 64QAM: 2112 bits

– **Spreading Factor 1**
QPSK: 1408 bits, 8PSK: 2112 bits, 16QAM: 2816 bits, 64QAM: 4224 bits

Suffix:

<n> 1...4
irrelevant

Query parameters:

LIST Queries the results of the Spectrum Emission Mask.
Refer to the `TRAC:DATA` command of the base unit for a more detailed description.

TRACE1 | TRACE2 | TRACE3 | TRACE4 Selects the trace to be queried.

Return values:

<active> Shows the number of active channels.

<code class> Shows the number of active channels.
Code class of the channel. The code class specifies the spreading factor of the channel. The range is **{0...4}**.
0 = spreading factor 1
1 = spreading factor 2
2 = spreading factor 4
3 = spreading factor 8
4 = spreading factor 16
For the data rates refer to the channel characteristics.

<cdpabsolute> Absolute channel power in dBm. The range is **{-∞...∞}**

<cdprelative> Relative channel power in dB. The range is **{-∞...∞}**

<cerror> Chip Rate Error in ppm.

<channel> Channel number. The range is **{1...16}**. The number of channels depends on the spreading factor

<channel type> **0** = inactive
1 = midamble
2 = DPCH
3 = P-CCPCH
4 = S-CCPCH
5 = FPACH
6 = PDSCH
7 = PICH

<code number> Code number of the channel, range is **{1...16}**. The number of channels depends on the spreading factor.

<evmpeak> Maximum value of the EVM.

<evmrms> Average value of the EVM.

<ferror> Frequency Error in Hz.

<ciqimbalance> and <iqoffset>	IQ Imbalance and IQ Offset in %.
<level>	Power level of the channel in dB or dBm. The range is **{-∞...∞}**
<maccuracy>	Composite EVM in %.
<midd1> and <midd2>	Power offset between sum power of channels belonging to midamble(k), only data field 1/2 and power of midamble(k)
<midamble shift>	Midamble Shift of the channel.
<modulation type>	Modulation type of the channel **0** = invalid (for midamble) **1** = QPSK **2** = 8PSK **3** = 16QAM **4** = 64QAM
<pcderror>	Peak Code Domain Error in dB.
<pd1> and <pd2>	Power of the data parts over all channels in dB. The range is **{-∞...∞}**
<pdata>	Mean power of both data parts (P1 and P2) over all channels in dBm. The range is **{-∞...∞}**
<pmidamble>	Power of the midamble in dB. The range is **{-∞...∞}**
<power detection>	**0** - inactive channel **1** - active channel
<rho>	Rho. The range is **{0...1}**.
<sfactor>	Spreading Factor of the channel. The range is **{1...16}**.
<slot>	Slot number. The range depends on the capture length.
<srate>	Data rate is kbps.
<tframe>	Trigger to Frame in ms. This value is valid only after successful synchronization to the TD-SCDMA signal. When using the Free Run trigger mode, the command returns a '9'.
<validity>	**0** = inactive channel **1** = active channel **2** = alias channel. The code class of these channels is <4, i.e. a channel consists of more than one code.
Usage:	Query only

4.9 Other Commands Referenced in this Manual

The following commands are identical to those in the base unit and are included in this manual only because they are specifically referenced here.

See also chapter 4.6.3, "Other SENSe Commands Referenced in this Manual", on page 184 andchapter 4.2.3, "Other CALCulate Commands Referenced in this Manual", on page 135 .

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4.9.1 INPut commands

INPut:ATTenuation <Value>

This command programs the input attenuator. To protect the input mixer against damage from overloads, the setting 0 dB can be obtained by entering numerals, not by using the DOWN command.

The attenuation can be set in 5 dB steps (with option R&S FSV-B25: 1 dB steps). If the defined reference level cannot be set for the set RF attenuation, the reference level is adjusted accordingly.

In the default state with "Spectrum" mode, the attenuation set on the step attenuator is coupled to the reference level of the instrument. If the attenuation is programmed directly, the coupling to the reference level is switched off.

This function is not available if the R&S Digital I/Q Interface (R&S FSV-B17) is active.

Parameters:

<Value> *RST: 10 dB (AUTO is set to ON)

Example: `INP:ATT 30dB`
Sets the attenuation on the attenuator to 30 dB and switches off the coupling to the reference level.

Mode: all

INPut:ATTenuation:AUTO <State>

This command automatically couples the input attenuation to the reference level (state ON) or switches the input attenuation to manual entry (state OFF).

This function is not available if the R&S Digital I/Q Interface (R&S FSV-B17) is active.

Parameters:

<State> ON | OFF

*RST: ON

Example: `INP:ATT:AUTO ON`
Couples the attenuation set on the attenuator to the reference level.

INPut:COUPling <CouplingType>

Toggles the RF input of the R&S FSV between AC and DC coupling.

This function is not available if the R&S Digital I/Q Interface (R&S FSV-B17) is active.

Parameters:

<CouplingType> AC | DC
*RST: AC

Example: `INP:COUP:DC`

INPut:DIQ:CDEVice

This command queries the current configuration and the status of the digital baseband input from the optional R&S Digital I/Q Interface (option R&S FSV-B17).

For details see the section "Interface Status Information" for the R&S Digital I/Q Interface (R&S FSV-B17) in the description of the base unit.

Return values:

<ConnState> Defines whether a device is connected or not.
0
No device is connected.
1
A device is connected.

<DeviceName> Device ID of the connected device

<SerialNumber> Serial number of the connected device

<PortName> Port name used by the connected device

<SampleRate> Maximum or currently used sampling rate of the connected device in Hz (depends on the used connection protocol version; indicated by <SampleRateType> parameter)

<MaxTransferRate> Maximum data transfer rate of the connected device in Hz

<ConnProtState> State of the connection protocol which is used to identify the connected device.
Not Started
Has to be Started
Started
Passed
Failed
Done

<PRBSTestState> State of the PRBS test.
Not Started
Has to be Started
Started
Passed
Failed
Done

<SampleRateType> **0**
Maximum sampling rate is displayed
1
Current sampling rate is displayed

<Placeholder> for future use; currently "0"

Example:
```
INP:DIQ:CDEV?
```
Result:
```
1,SMU200A,103634,Out
A,70000000,100000000,Passed,Not Started,0,0
```

Mode: IQ, VSA, EVDO, CDMA, WCDMA, GSM, ADEMOD, TDS

INPut:DIQ:RANGe:AUTO <State>

If enabled, the digital input fullscale level is automatically set to the value provided by the connected device (if available).

This command is only available if the optional Digital Baseband interface (option R&S FSV-B17) is installed.

For details see the Digital Baseband Interface (R&S FSV-B17) description of the base unit.

Parameters:
<State> ON | OFF
*RST: OFF

Example:
```
INP:DIQ:RANG:AUTO ON
```

Mode: IQ, VSA, EVDO, CDMA, WCDMA, GSM, ADEMOD, TDS

INPut:DIQ:RANGe:COUPling <State>

If enabled, the reference level for digital input is adjusted to the full scale level automatically if the fullscale level changes.

This command is only available if the optional R&S Digital I/Q Interface (option R&S FSV-B17) is installed.

For details see the R&S Digital I/Q Interface (R&S FSV-B17) description of the base unit.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `INP:DIQ:RANG:COUP OFF`

Mode: IQ, VSA, EVDO, CDMA, WCDMA, GSM, ADEMOD, TDS

INPut:DIQ:RANGe[:UPPer] <Level>

Defines or queries the "Full Scale Level", i.e. the level that should correspond to an I/Q sample with the magnitude "1".

It can be defined either in dBm or Volt (see "Full Scale Level" on page 48).

This command is only available if the optional R&S Digital I/Q Interface (option R&S FSV-B17) is installed.

For details see the R&S Digital I/Q Interface (R&S FSV-B17) description of the base unit.

Parameters:

<Level> <numeric value>

Range: 70.711 nV to 7.071 V

*RST: 1 V

Example: `INP:DIQ:RANG 1V`

Mode: A, IQ, NF, TDS, VSA, CDMA, EVDO, WCDMA, ADEMOD, GSM, OFDM, OFDMA/WiBro, WLAN

INPut:DIQ:RANGe[:UPPer]:UNIT <Unit>

Defines the unit of the full scale level (see "Level Unit" on page 48). The availability of units depends on the measurement application you are using.

This command is only available if the optional R&S Digital I/Q Interface (option R&S FSV-B17) is installed.

For details see the R&S Digital I/Q Interface (R&S FSV-B17) description of the base unit.

Parameters:

<Level> V | dBm | dBpW | W | dBmV | dBuV | dBuA | A

*RST: Volt

Example: `INP:DIQ:RANG:UNIT A`

Mode: IQ, VSA, EVDO, CDMA, WCDMA, GSM, ADEMOD, TDS

INPut:DIQ:SRATe <SampleRate>

This command specifies or queries the sample rate of the input signal from the R&S Digital I/Q Interface (see "Input Sample Rate" on page 48).

This command is only available if the optional R&S Digital I/Q Interface (option R&S FSV-B17) is installed.

For details see the R&S Digital I/Q Interface (R&S FSV-B17) description of the base unit.

Parameters:

<SampleRate> Range: 1 Hz to 10 GHz
*RST: 32 MHz

Example: INP:DIQ:SRAT 200 MHz

Mode: A, IQ, NF, TDS, VSA, CDMA, EVDO, WCDMA, ADEMOD, GSM, OFDM, OFDMA/WiBro, WLAN

INPut:DIQ:SRATe:AUTO <State>

If enabled, the sample rate of the digital baseband IQ input signal is set automatically by the connected device, if the currently used sample rate is provided (indicated by the <SampleRateType> parameter in the result of the `INPut:DIQ:CDEVice` command.

This command is only available if the optional R&S Digital I/Q Interface (option R&S FSV-B17) is installed.

For details see the R&S Digital I/Q Interface (B17) description of the base unit.

Parameters:

<State> ON | OFF
*RST: OFF

Example: `INP:DIQ:SRAT:AUTO ON`

Mode: IQ, VSA, EVDO, CDMA, WCDMA, GSM, ADEMOD, TDS

INPut:EATT <Attenuation>

This command defines the electronic attenuation.

If necessary, the command also turns the electronic attenuator on.

This command is only available with option R&S FSV-B25, but not if R&S FSV-B17 is active.

The attenuation can be varied in 1 dB steps from 0 to 25 dB. Other entries are rounded to the next lower integer value.

If the defined reference level cannot be set for the given RF attenuation, the reference level is adjusted accordingly and the warning "Limit reached" is output.

Parameters:

<Attenuation> 0...25
*RST: 0 dB (OFF)

Example: `INP1:EATT 10 dB`

Mode: all

INPut:EATT:AUTO <State>

This command switches the automatic behaviour of the electronic attenuator on or off. If activated, electronic attenuation is used to reduce the operation of the mechanical attenuation whenever possible.

This command is only available with option R&S FSV-B25, but not if R&S FSV-B17 is active.

Parameters:

<State> ON | OFF

*RST: ON

Example: `INP1:EATT:AUTO OFF`

Mode: all

INPut:EATT:STATe <State>

This command turns the electronic attenuator on or off.

This command is only available with option R&S FSV-B25, but not if R&S FSV-B17 is active.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `INP:EATT:STAT ON`
Switches the electronic attenuator into the signal path.

INPut:GAIN:STATe <State>

This command turns the 20 dB preamplifier on and off.

With option R&S FSV-B22, the preamplifier only has an effect below 7 GHz.

With option R&S FSV-B24, the amplifier applies to the entire frequency range.

This command is not available when using R&S Digital I/Q Interface (R&S FSV-B17).

Parameters:

<State> ON | OFF

*RST: OFF

Example: `INP:GAIN:STAT ON`
Turns the preamplifier on.

INPut:IMPedance <Impedance>

This command selects the nominal input impedance.

75 Ω should be selected if the 50 Ω input impedance is transformed to a higher impedance using a 75 Ω adapter of the RAZ type (= 25 Ω in series to the input impedance of the instrument). The correction value in this case is 1.76 dB = 10 log (75Ω/50Ω).

This function is not available if the R&S Digital I/Q Interface (R&S FSV-B17) is active.

Parameters:

<Impedance> 50 | 75

*RST: 50 Ω

Example: `INP:IMP 75`

INPut:SELect <Source>

This command selects the signal source for measurements.

Parameters:

<Source> RF | DIQ

RF
Radio Frequency ("RF INPUT" connector)

DIQ
Digital IQ (only available with R&S Digital I/Q Interface, option R&S FSV-B17)

*RST: RF

Example: INP:SEL RF

Mode: A, IQ, NF, TDS, VSA, CDMA, EVDO, WCDMA, ADEMOD, GSM, OFDM, OFDMA/WiBro, WLAN

4.9.2 TRIGger Commands

TRIGger<n>[:SEQuence]:LEVel:BBPower <Level>

This command sets the level of the baseband power trigger source (for digital input via the R&S Digital I/Q Interface, R&S FSV-B17).

Suffix:

<n> irrelevant

Parameters:

<Level> Range: -50 dBm to +20 dBm

*RST: -20 DBM

Example: `TRIG:LEV:BB -30DBM`

Mode: All

TRIGger<n>[:SEQuence]:BBPower:HOLDoff <Value>

This command sets the holding time before the next BB power trigger event (for digital input via the R&S Digital I/Q Interface, R&S FSV-B17).

Suffix:
<n> irrelevant

Parameters:
<Value> *RST: 150 ns

Example: `TRIG:SOUR BBP`
Sets the baseband power trigger source.
`TRIG:BBP:HOLD 200 ns`
Sets the holding time to 200 ns.

Mode: all

TRIGger<n>[:SEQuence]:IFPower:HOLDoff <Value>

This command sets the holding time before the next IF power trigger event.

Suffix:
<n> irrelevant

Parameters:
<Value> *RST: 150 ns

Example: `TRIG:SOUR IFP`
Sets the IF power trigger source.
`TRIG:IFP:HOLD 200 ns`
Sets the holding time to 200 ns.

TRIGger<n>[:SEQuence]:IFPower:HYSTeresis <Value>

This command sets the limit that the hysteresis value for the IF power trigger has to fall below in order to trigger the next measurement.

Suffix:
<n> irrelevant

Parameters:
<Value> *RST: 3 dB

Example: `TRIG:SOUR IFP`
Sets the IF power trigger source.
`TRIG:IFP:HYST 10DB`
Sets the hysteresis limit value.

TRIGger<n>[:SEQuence]:HOLDoff[:TIME] <Delay>

This command defines the length of the trigger delay.

A negative delay time (pretrigger) can be set in zero span only.

Suffix:
<n> irrelevant

Parameters:

<Delay> Range: zero span: -sweeptime (see data sheet) to 30 s; span: 0 to 30 s
*RST: 0 s

Example: `TRIG:HOLD 500us`

TRIGger<n>[:SEQuence]:LEVel[:EXTernal] <TriggerLevel>

This command sets the level of the external trigger source in Volt.

Suffix:

<n> irrelevant

Parameters:

<TriggerLevel> Range: 0.5 V to 3.5 V
*RST: 1.4 V

Example: `TRIG:LEV 2V`

TRIGger<n>[:SEQuence]:SLOPe <Type>

This command selects the slope of the trigger signal. The selected trigger slope applies to all trigger signal sources.

Suffix:

<n> irrelevant

Parameters:

<Type> POSitive | NEGative
*RST: POSitive

Example: `TRIG:SLOP NEG`

TRIGger<n>[:SEQuence]:SOURce <Source>

This command selects the trigger source.

For details on trigger modes refer to the "Trg/Gate Source" softkey in the base unit description.

Suffix:

<n> irrelevant

Parameters:

<Source>

IMMediate
Free Run

EXTern
External trigger

IFPower
Power trigger at the second intermediate frequency

RFPower
Power trigger at the first intermediate frequency

TIME
Time interval

PSEN
External power sensor (requires R&S FSV-K9 option)

*RST: IMMediate

Example: `TRIG:SOUR EXT`
Selects the external trigger input as source of the trigger signal

4.9.3 Other Referenced Commands

ABORt

This command aborts a current measurement and resets the trigger system.

Example: `ABOR;INIT:IMM`

Mode: all

DIAGnostic<n>:SERVice:NSOurce <State>

This command switches the 28 V supply of the noise source on the front panel on or off.

Suffix:

<n> irrelevant

Parameters:

<State> ON | OFF

*RST: OFF

Example: `DIAG:SERV:NSO ON`

FORMat:DEXPort:DSEParator <Separator>

This command defines which decimal separator (decimal point or comma) is to be used for outputting measurement data to the file in ASCII format. Different languages of evaluation programs (e.g. MS-Excel) can thus be supported.

Parameters:

<Separator> POINt | COMMA

*RST: (factory setting is POINt; *RST does not affect setting)

Example: `FORM:DEXP:DSEP POIN`
Sets the decimal point as separator.

INITiate<n>:CONMeas

This command restarts a measurement that has been stopped in single sweep mode.

The measurement is restarted at the first sweep point.

As opposed to `INITiate<n>[:IMMediate]`, this command does not reset traces in maxhold, minhold or average mode. Therefore it can be used to continue measurements using max hold or averaging functions.

In single sweep mode, you can synchronize to the end of the measurement with *OPC, *OPC? or *WAI. In continuous sweep mode, synchronization to the end of the measurement is not possible. Thus, it is not recommended that you use continuous sweep mode in remote control, as results like trace data or markers are only valid after a single sweep end synchronization.

Suffix:

<n> irrelevant

Example: `INIT:CONT OFF`
Switches to single sweep mode.
`DISP:WIND:TRAC:MODE AVER`
Switches on trace averaging.
`SWE:COUN 20`
Setting the sweep counter to 20 sweeps.
`INIT;*WAI`
Starts the measurement and waits for the end of the 20 sweeps.
`INIT:CONM;*WAI`
Continues the measurement (next 20 sequences) and waits for the end.

INITiate<n>:CONTinuous <State>

This command determines whether the trigger system is continuously initiated (continuous) or performs single measurements (single).

The sweep is started immediately.

Suffix:

<n> irrelevant

Parameters:

<State> ON | OFF

*RST: ON

Example: `INIT:CONT OFF`
Switches the sequence to single sweep.
`INIT:CONT ON`
Switches the sequence to continuous sweep.

Mode: all

INITiate<n>:ESPectrum

This command starts a Spectrum Emission Mask measurement.

Suffix:
<n> irrelevant

Example: `INIT:ESP`
Starts a Spectrum Emission Mask measurement.

INITiate<n>[:IMMediate]

The command initiates a new measurement sequence.

With sweep count > 0 or average count > 0, this means a restart of the indicated number of measurements. With trace functions MAXHold, MINHold and AVERage, the previous results are reset on restarting the measurement.

In single sweep mode, you can synchronize to the end of the measurement with *OPC, *OPC? or *WAI. In continuous sweep mode, synchronization to the end of the measurement is not possible. Thus, it is not recommended that you use continuous sweep mode in remote control, as results like trace data or markers are only valid after a single sweep end synchronization.

Suffix:
<n> irrelevant

Example: `INIT:CONT OFF`
Switches to single sweep mode.
`DISP:WIND:TRAC:MODE AVER`
Switches on trace averaging.
`SWE:COUN 20`
Setting the sweep counter to 20 sweeps.
`INIT;*WAI`
Starts the measurement and waits for the end of the 20 sweeps.

Mode: all

MMEMory:STORe<n>:LIST <FileName>

This command stores the current list evaluation results in a `<file name>.dat` file. The file consists of a data section containing the list evaluation results.

Suffix:
<n> irrelevant

Parameters:

<FileName> <file name>

Example: `MMEM:STOR:LIST 'test'`
Stores the current list evaluation results in the `test.dat` file.

MMEMory:STORe<n>:TRACe <Trace>, <FileName>

This command stores the selected trace in the specified window in a file with ASCII format. The file format is described in chapter 3.3.6, "ASCII File Export Format", on page 110

The decimal separator (decimal point or comma) for floating-point numerals contained in the file is defined with the `FORMat:DEXPort:DSEParator` command (see `FORMat:DEXPort:DSEParator` on page 234).

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

Parameters:

<Trace> 1 to 6

selected measurement trace

<FileName> DOS file name
The file name includes indication of the path and the drive name. Indication of the path complies with DOS conventions.

Example: `MMEM:STOR:TRAC 3,'TEST.ASC'`
Stores trace 3 in the file TEST.ASC.

OUTPut:IF[:SOURce] <Source>

This command selects the source of the IF output.

Parameters:

<Source> **IF**
intermediate frequency output

VIDeo
video output, 200 mV

*RST: IF

Example: `OUTP:IF VID`
Selects the video signal for the IF output connector.

OUTPut:TRIGger <PortLevel>

This command selects level of the Trigger Out port. Thus, you can trigger an additional device via the external trigger port, for example.

Parameters:

<PortLevel> LOW | HIGH

*RST: LOW

Example: `OUTP:TRIG HIGH`

SYSTem:DISPlay:UPDate <State>

In remote control mode, this command switches on or off the instrument display. If switched on, only the diagrams, traces and display fields are displayed and updated.

The best performance is obtained if the display output is switched off during remote control.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `SYST:DISP:UPD ON`

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